Digital Digest

Vol. 2 No. 5 **Devoted entirely to Digital Amateur Radio Communications** September/October, 1989

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The DIGIPEATER . . .
features new product announcements... an article on Packet Radio - The User Interface (LanLink)... some interesting listening "between the ham bands..." and more!

PACKET . . .
Lynn Taylor, WB6UUT
continues his study of AX.25 with a look at frame relationships and gives examples...

AMTOR . . .
Norman Sternberg, W2JUP
picks up his discussion of AMTOR with an overview of the operation, performance and application of this digital mode...

BITS & BYTES . . .
Lacy McCall, AC4X
takes a look at the current state of communications in our society... and other topics...

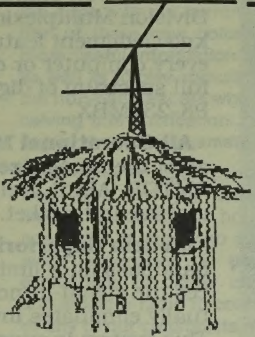
PROGRAMMER'S Notebook...
Pete Smith, N4ZR
talks about programming and software for the contester...

ACTION . . .
Jim Mulvey, KS1A
in beginning his column "Action on the Ham Bands" gives some practical "first-hand" advice on *how not* to use your new TNC...

SOFTWARE . . .
Mike Bryce, WB8VGE
begins his new column with a review of the HAMRAD Logging Program...

COMPUTERS . . .
Jonathan Mayo, KR3T
in Part 1 of his discussion on computer viruses talks about what these viruses are, and how to identify them...

There's all this, and a whole lot more in this issue!

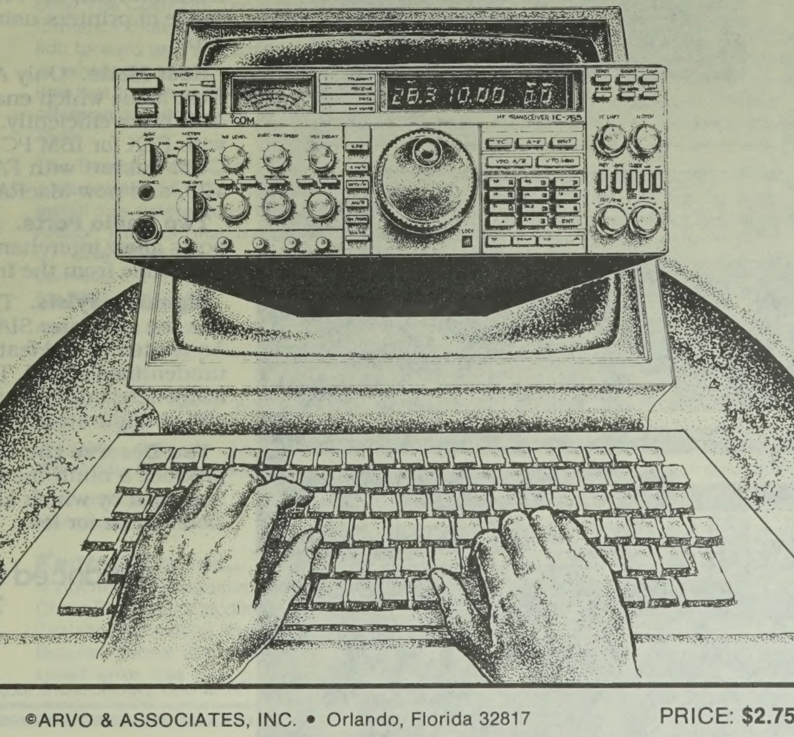


From The Publisher's Shack

Ham radio received some high marks in visibility this past month with the passing of one of the biggest storms of the century, namely hurricane Hugo. During the 48 hours preceding Hugo's devastation of Charleston, South Carolina, I personally counted an approximate dozen mentions of ham operators activities on the local TV and radio stations. One Orlando TV station in particular, interviewed a ham at his residence (on several occasions), at the controls of his station. The whole crux of the interview, and of the many other news reports was of the capability of hams to provide communication assistance in times of disaster, or pending disaster. The only problem with this kind of public relations is that it takes a disaster to bring ham radio to the surface of most peoples everyday awareness. Disasters (fortunately), do not occur everyday, and with no disaster, ham radio seems to slip back into the general publics subconsciousness, at best. I mention this, purely as food for thought as to what we can all do to help promote our hobby during the down (no disaster) times...

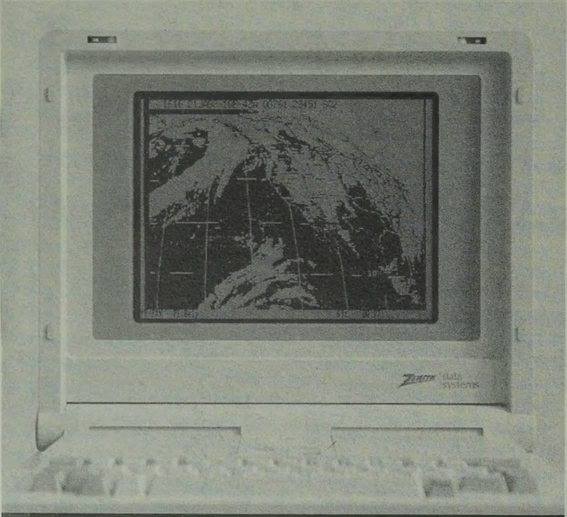
(cont'd on page 3)

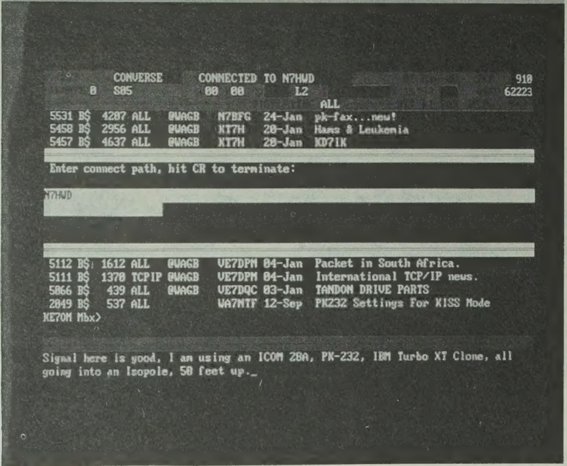
Your computer & amateur radio puts the world at your fingertips!



©ARVO & ASSOCIATES, INC. • Orlando, Florida 32817 PRICE: $2.75

AEA's NEW PK-232MBX With PakMail™





```
      CONVERSE     CONNECTED TO N7HWD                       910
    0  S05           00  00        L2                     62223
                                     ALL
 5531 B$  4207 ALL   @WAGB   N7BFG  24-Jan  pk-fax...new!
 5458 B$  2956 ALL   @WAGB   KT7H   20-Jan  Hams & Leukemia
 5457 B$  4637 ALL   @WAGB   KT7H   20-Jan  KD7IK

 Enter connect path, hit CR to terminate:

N7HWD


 5112 B$  1612 ALL   @WAGB   VE7DPM 04-Jan  Packet in South Africa.
 5111 B$  1370 TCPIP @WAGB   VE7DPM 04-Jan  International TCP/IP news.
 5066 B$   439 ALL   @WAGB   VE7DQC 03-Jan  TANDON DRIVE PARTS
 2049 B$   537 ALL           WA7NTF 12-Sep  PK232 Settings For KISS Mode
KE70M Mbx>

Signal here is good, I am using an ICOM 28A, PK-232, IBM Turbo XT Clone, all
going into an Isopole, 50 feet up._
```

Now AEA's popular PK-232MBX multi-mode data controller has all of the features you've been asking for...PakMail™ mailbox with third-party traffic, seven-character AMTOR sel-call, TDM (Time Division Multiplexing) Rx for SWL and priority acknowledgment features. Compatible with almost every computer or data terminal, you can enjoy the full spectrum of digital communications with the PK-232MBX.

All Operational Modes. The PK-232MBX includes all of the **recognized** data modes available today... AMTOR, ASCII, Baudot, CW, FAX Tx and Rx, NAVTEX marine and packet.

Modem Superiority. An eight-pole chebyshev bandpass filter limiter-discriminator modem enhances the signal-to-noise ratio at the detector and virtually eliminates interference from adjacent signals. This system is superior to PLL modem technology which was designed for minimal noise interference.

PakMail.™ PakMail™ mailbox with third-party traffic is now a standard feature. Leave and retrieve packet messages around the clock. The PakMail™ plug-in board/update is compatible with all PK-232's. Contact factory for details. The upgrade also includes TDM (Time Division Multiplexing) decoding and seven-character AMTOR sel-call. Priority acknowledgment is also included to reduce packet collisions.

FAX Transmission. The **first** multi-mode TNC to transmit FAX, the PK-232/MBX supports the widest range of printers using the optional RS-232/printer cable.

Host Mode. Only AEA provides a fully functional Host Mode which enables programs to control the TNC more efficiently. Programs include PC-Pakratt with FAX for IBM PC and compatible computers, COM-Pakratt with FAX for the Commodore 64 and 128, and now MacRATT with FAX for the Macintosh.

Two Radio Ports. Independent radio connection ports allow interchangeable HF or VHF operation, selectable from the front panel for convenience.

Signal Anaylsis. The PK-232MBX internal software has the exclusive SIAM™ (Signal Identification and Aquisition Mode) feature which lets you tune an unidentified signal. The PK-232MBX can automatically determine the signal's mode, baud rate or speed and configuration.

You Deserve the Original. AEA was the first to produce a multi-mode TNC, and it still remains the standard by which all other TNC's are compared. Don't settle for less.

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2006-196th St. SW/P.O. Box 2160
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206-775-7373

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The DIGIPEATER

News & Information communicated from various sources.

From The Publisher's Shack

(cont'd from front page)

I wish to thank INFO Magazine for the nice mention of Digital Digest in the current Sep/Oct issue of their publication. We received several new subscriptions from the report as well as inquiries from computer hobbyist wanting more information on Ham Radio. INFO is a computer hobbyist magazine geared primarily to Commodore, and more specifically, Amiga users. If you're into any type of "Desktop Publishing", then you really ought to get your hands on INFO for inspiration. My understanding is that INFO is page assembled solely (except for client supplied advertising) on the Amiga computer. If you can't find INFO at your favorite news and magazine stand you can write to them at:
INFO MAGAZINE, P.O. Box 2300, Iowa City, IA 52244 or telephone
(319) 338-0897. Published bimonthly, subscription price is $20.00 U.S. or $26.00 foreign.

Digital Digest is getting bigger (I seem to keep saying this with every new issue, but it's true) with more subscribers, advertisers and content. I wish to again thank all who advertise, subscribe or write for the publication for your continued support!

We've added some new columns to the publication, and revamped others. There is now an AMTOR column by Norman Sternberg, W2JUP. Norman has been with the publication since its inception as well as an inspiration in its development. Norman has graciously accepted the post of AMTOR columnist, vacated, due to other commitments by Paul Newland, AD7I. We do anticipate however, hearing from Paul with future guest articles as his schedule permits and wish him all the best with his current business endeavors.

We've also added a general software review column which will be written by Mike Bryce, WB8VGE. Here you'll read about logging and the various utility software available. Mike is well known for his various amateur activities in the realm of computers, software, and QRP operations and will be sharing his insights and knowledge on these subjects in future issues.

Jim Mulvey, KS1A will be sharing in non-technical jargon, operations on the various modes of amateur digital communications. Jim will discuss his activities, observations, and operations on the ham bands as well as be giving useful and exciting listener information on the shortwave spectrum. Jim is well known for his contributions to CompuServe's Hamnet, an on-line amateur radio information service.

The HF DATACOM column has been eliminated. Material which would have fallen into that column will now be part of our general DIGIPEATER heading. This expands the scope of the listing and will include news, information, reviews and operational articles which do not fit into any of our other columns.

We hope with our current, and the addition of these new columns to provide more useful information to active hams as well as to give stimulating reading to the non-ham readers who have been receiving this publication... an inspiration to join the ranks of amateur radio.

We extend an open invitation to hams who have not yet joined the digital modes, to computer hobbyist, and all non-hams at large who are interested in more information on getting into the excitement of digital communications and amateur radio to contact us directly or any of our columnists. We'll be happy to answer your questions and to help you get started in this exciting and diversified hobby. This offer is made with respect to our continued goal for Digital Digest to be a viable catalyst in the knowledge and growth of Amateur Radio.

Till next issue... 73's, Tom / WA8DXD

Cushcraft Corporation...

announces design of new Ten Meter Yagi antenna for the novice or experienced ham looking for performance and economy! The Cushcraft Ten-3 is a high performance three element Yagi that offers 8db forward gain at a price affordable to all who want to enjoy the DX opportunities that 10 meters offers. The beam also offers an excellent front to back ratio of 25db.

The Ten-3 has an 8 foot boom, and takes a mast size of 1.5 to 2.0", making it easy to install on a simple mount with only a light rotator. The reddi match system provides 50 ohm feed for a standard PL259 connector. The antenna is power rated for 2000 watts P.E.P.

Assembly is quick and easy from detailed instructions and precision manufactured components.

All tubing is heavy wall hard drawn, bright finish aluminum. The Ten-3 is available through Amateur Dealers Worldwide. For more information, contact:

Cushcraft Corporation, P. O. Box 4680
Manchester, NH 03108 (603) 627-7877

Kantronics, Inc...

announces the appointment of Southern Cross Electronics as distributor for New Zealand. Kantronics designs and manufactures packet radio modems for high speed error free data communications.

Buckmaster Publishing...

announces a new and major reference tool on CD-ROM. The "HamCall" disc, can quickly provide access to approximately one-half million FCC licensed U.S. Radio Amateur Operators.. Name, address, class, etc. is on the disc. All club, military and RACES stations are included, as well as over one hundred BASIC language computer programs useful to radio operators.

Ten directories full of public domain, ham related material are included (i.e. - country listings, plus hundreds of programs and data). Foreign call sign data, longitude/latitude for one million places, QSL managers, AM/FM broadcast frequency files, etc., will be added as available.

The HamCall database and software, are contained on one CD-ROM, and is priced at $100.00 postpaid (U.S.). Additional PDSC software for full boolean search of the data base, is available at additional cost. Semi-annual disc updates are planned. The data contained in the product was last updated in February, 1989.

Minimum hardware required to operate the system includes: a Hitachi, Sony or Phillips CD-ROM player (other generally acceptable), an IBM compatible computer running under MS/PC-DOS 3.1 or greater, plus 640K. Elementary PDSC retrieval software accompanies the CD-ROM disc. The disc uses the CDROM, ISO-9660 standard (accessed by Microsoft CD-ROM extensions v2.0+).

It is anticipated that individuals and clubs with active stations, short wave listeners, and packet bulletin board operators will find this new product attractive for quick and accurate access to the Buckmaster database.

The product can be used alone as a valuable reference file for QSL's or by organizations compiling area directories or performing mailings. Equipment manufacturers and dealers will find the data valuable for promotional use and verifying FCC records prior to shipment of product, etc.

To order the "HamCall" CD-ROM, write or phone Buckmaster Publishing directly at 800-282-5628, ask for Jack Speer, N1BIC. Purchase orders and VISA/MC accepted. THe CD-ROM comes with a full satisfaction or money back guarantee.

*** *Please Note* ***

If you have news and information of interest to the digital amateur community, please let us know!

— Editor —

by Lynn W. Taylor, WB6UUT
463 Myrtle Street • Laguna Beach, CA 92651

AX.25: Frame Relationships

Last issue we talked about how individual AX.25 frames are constructed. This time, our subject is the relationship between the individual frame types.

The following examples are actual, over-the-air frames picked from several hours of monitoring at WB6UUT, and should be a fair representation of the common frames in your local network. These frames were monitored using an AEA PK-87 and Packet-PLUS software on an IBM compatible system.

As we discussed last month, the three frame types are Information (I) frames, Supervisory (S) frames, and Unnumbered (U) frames.

Every connection begins and ends with the exchange of U frames: a connection is established with a SABM frame, and acknowleged with a UA frame, and terminated with a DISC frame and a UA frame. A sample connect sequence follows:

```
N6FVV*>WD6FPY (C,P)
WD6FPY*>N6FVV (UA,F)
```

The first frame is being transmitted by N6FVV, to WD6FPY, on an AEA TNC, the square brackets indicate that the command bit is set, the C indicates that this is a SABM (Set Asynchronous Balanced Mode) frame, and the P indicates that the poll bit is set. When the receiving station sees that the poll is sent, it immediately sends the desired UA frame (unnumbered acknowlege), with the final bit set, and the parentheses indicate that the command bit is not set (i.e. this is a response). At this point the link exists.

To disconnect, the following sequence is followed:

```
N6FVV*>WD6FPY (D,P)
WD6FPY*>N6FVV (UA,F)
```

N6FVV is now disconnecting from WD6FPY. The first frame is a DISC frame, it is a command, and is sent with the poll bit on. The response from WD6FPY is a UA frame with the final bit set and is a response.

If a station cannot accept whatever frame is sent, the response is a DM (disconnected mode) frame. You will see DM frames appear under two conditions: when a station cannot accept a new connect or when a station receives a frame addressed to it and no connection exists.

```
WD6DJX>W6OGC*>W6PNT (C,P)
W6PNT>W6OGC*>WD6DJX (DM,F)
```

In the above example, W6PNT cannot accept another connection at this time. This example also shows the use of W6OGC as a digipeater and was not monitored direct.

Unnumbered Information frames are "CQ" frames or other types of identification or general information, as shown below:

```
WA6HJF*>ID (UI):
DANAPT, WA6HJF digipeater
```

This frame was generated to identify the WA6HJF digipeater, it is a command, and contains the text "DANAPT, WA6HJF digipeater" in the information field. It is possible to send a UI frame with the poll bit set, and if the destination station exists, it should send a DM frame with the final bit set. This capability could be used to "ping" and see if a certain station is on, or if a path is usable without actually connecting. No current TNCs implement this capability.

Information and Supervisory frames must be covered together: the I frames carry the information, and the S frames serve as acknowlegements and flow control. The following is a common exchange:

```
N6FVV*>K6UV (I,P;1,4):
Take care.
K6UV*>N6FVV (RR,F;5)
```

The first frame above is an information frame, it is a command, the poll bit is set, it is frame number four, the receiver expects frame one as the next frame sent by K6UV, and it contains the text "Take care." The response from K6UV is a Received-Ready frame, it is a response, the final bit is set and K6UV expects frame five next. In other words, N6FVV said "Take care." and K6UV got it without error. If the TNC buffers were full at K6UV, the response would have been:

```
K6UV*>N6FVV (RN,F;5)
```

This frame matches the one above except the TNC at K6UV is telling N6FVV that there is no room for an additional frame, and N6FVV will wait until buffer space becomes available. When space becomes available, K6UV will send an RR.

If a station misses the acknowlege, or if a certain amount of time has passed with no link activity, one of the stations will "poll" to make sure the radio link is still working:

```
N6FVV*>K6UV (RR,P;1)
K6UV*>N6FVV (RR,F;3)
```

N6FVV is sending the poll, which is a Received-Ready sent as a command and indicating that the next frame expected at N6FVV is frame one. K6UV responds with a Received-Ready and indicates that he expects frame three next. If the response indicates to N6FVV that his most recent frame had been missed, he would retransmit the frame. The use of a poll before repeating an entire I frame saves retransmitting frames when the acknowlege (RR or RNR) frame gets lost.

REJ frames are sent when the receiving station misses a frame:

```
KB6FYG>LAGUNA*>AA6FU-15 (I;1,2):
Msg#  Size  To  From  Date  Time
KB6FYG>LAGUNA*>AA6FU-15 (I,P;1,3):
1    356 AA6FU KB6FYG 29-Aug-89 23:14:29
AA6FU-15*>LAGUNA>KB6FYG (RJ;2)
```

In the above example, AA6FU has missed the first frame (frame two) and received the second frame (frame three). The response is a reject frame, it is a response and it tells the TNC at KB6FYG that it should repeat frames starting with frame two.

Notice that the frame number given in a supervisory frame is always the number of the next frame expected, not the number of the last frame received.

The only frame type which I have not shown is a FRMR. These frames are extremely rare because the receiving TNC must get a frame which is correctly received, addressed to it, but assembled incorrectly. This usually indicates a bug in the originator's implementation of AX.25.

I hope this article is enough to encourage some of you to spend some time watching your local network, it may really open your eyes to some things...

Soapbox:

We've all heard the saying, "If it ain't broke, don't fix it," and I'm sure most of apply that thinking to Packet Radio.

Wrong.

The problem is simple: AX.25 covers up a multitude of sins, many of which have been covered in this column, or by W2JUP in his. If your modulation is too high, or if your tones are a little off, it just means a retry or two extra. If you aren't running pPersistence, it's just a few collisions, but the data gets through. In fact, I'd be willing to bet that most packet operators don't even realize when their station is struggling to maintain communication.

The moral is, look at what your TNC, and those of your neighbors are doing, look for repeated retries and missed frames, look for repeated collisions and let your friends know. Tell them what what you see, what it means, and help them find the solution. Also, ask them to watch your system, or test and see how many tries it takes to get to a well adjusted station and let's try to get things dialed in as much as possible.

Next time we'll move on to layer 3, and start talking about the future of Packet Radio.

Packet-PLUS...

New full-featured terminal software supporting AEA's PK-87, PK88, PK-232 and the Heathkit HK-232.

Features:

- True multi-connect software: Easily handle up to 10 connects simultaneously. No confusion, no lines interleaving, no need for Switchchar approach, just push one function key tochange from QSO to QSO. You can be receiving a file or message from a BBS while connecting to a distant nodewhile talking to a nearby friend while sending a CQ while monitoring the channel. And it's VERY easy to do! We challenge any other program to do what Packet-PLUS can do.
- Full channel monitoring: Separate screen monitors every frame your TNC can decode. No more guessing what's going on.
- Binary File Transfer: Any file type (.EXE, .ARC, .COM, .ZIP etc) can be sent or received with other Packet PLUS users. You can also chat on the same channel during a file transfer.
- Text File Transfer: Send "brag tape" or any other text file to any other station.
- Point and Shoot operation: Selecting files for transfer requires one function key, then highlight the file and push the Enter key. This technique is also used to change several TNC parameters that you store in text editable .TNC files (Startup.tnc, shutdown.tnc, mailon.tnc, etc).
- Quick Connect list: Use the utility program to create lists of stations (bbs, friends, etc) and connect paths. Then when you want to connect, use the Point and Shoot approach, highlight the station, and Packet PLUS will establish the connect, automatically.
- QSO log: Keep track of names, addresses, station information for instant recall when connected.
- Name Log: When you are connected (either you initiate the connect or the other station does it) the other station's operator name appears next to the callsign. No more forgetting names, or asking yourself "Do I know this person??"
- Multi-mode support for PK-232: Packet, Baudot, Ascii, Morse, Amtor.
- Maildrop support for PK-88
- Direct Terminal Mode Available: You can easily talk "direct" to your TNC using the direct terminal mode. Useful for following the AEA manual, learning about the TNC operation, and learning how the Packet-PLUS mode of operation makes Packet Radio truly enjoyable.
- ShareWare version of program included with your Packet-PLUS order. Give it to a friend to sample the multi-connect features. ShareWare version supports 3 connects, but doesn't have file transfer, Logging, multi-mode or maildrop support, but it demonstrates the multi-connect features.

  Packet-PLUS is written by Lynn Taylor, WB6UUT and includes complete documentation with 50 page printed manual and examples.

Introductory price of Packet PLUS is $34.95. Send payment to:

INTERFLEX CORPORATION, P.O. Box 5168, Laguna Niguel, CA 92677
Tel: (714) 496-9535. Be sure to include your callsign with order.

Orders processed within 48 hours, shipped via UPS.
California residents add 6% sales tax.

Boston Computer Society forms Ham Radio SIG...

The Boston Computer Society (BCS), the world's largest association of personal computer users, recently announced the establishment of an Amateur Radio Special Interest Group. The BCS Member Services Committee voted to establish the new ham radio group to tap the synergy existing between personal computing and Amateur Radio.

"The formation of this special interest group will bridge two distinct, but complimentary fields of interest," said Barry Porter, KB1PA, director of the Amateur Radio Special Interest Group. "It exposes personal computer users to ham radio, while alowing Amateur Radio operators to take advantage of the wealth of resources made available by the BCS, such as an abundance of technically competent members, an enthusiastic

(cont'd on page 13)

MFJ Multi-mode

9 modes for only . . . $279.95

Using the latest advances, MFJ brings you 9 exciting digital modes *and* keeps on bringing you state-of-the-art advances.

You get tons of features other multi-modes just don't have.

Only MFJ gives you all 9 modes

You get 9 fun modes -- Packet, AMTOR, RTTY, ASCII, CW, WeFAX, SSTV, Navtex and Contest Memory Keyer.

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New Easy Mail™ Personal Mailbox

You get MFJ's new **Easy Mail™** Mailbox with soft-partitioned memory so you and your buddies can leave messages for each other 24 hours a day.

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MFJ's unequaled tuning indicator makes it easy to work HF packet stations.

You use it the same way for *all* modes -- not different for each mode.

Multi-Gray Level FAX/SSTV Modem

You'll enjoy natural looking pictures that multiple gray levels can give you.

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MFJ's new *Anti-collision* technology gets packets through faster, more reliably.

How? Automatic random transmit delays prevent packet collisions.

Plus more . . .

Plus you get . . . 32K RAM, free AC power supply, KISS, *true* DCD, free eprom upgrade, random code generator, independent printer port, lithium battery backup, RS-232 *and* TTL serial ports, *standard* 850 Hz RTTY shift, socketed ICs, tune command, automatic serial numbering, programmable message memories, dual radio ports and more -- all in a sleek 9½ x 9½ x 1½ inch cabinet.

MFJ Packet Radio

MFJ-1274
$159⁹⁵

MFJ-1270B
$139⁹⁵

MFJ-1270B super clone of TAPR's TNC-2 give you more features than *any* other packet controller -- for $139.95.

You can operate both VHF *and* HF packet because you get **high performance** switchable VHF/HF modems.

You get **Easy Mail™** Personal Mailbox, FAX reception, KISS, Net Rom compatibility, 32K RAM, AC power supply, one year *unconditional* guarantee and more.

For dependable HF packet tuning, the **MFJ-1274** gives you a tuning indicator that's accurate to within 10 Hz -- and it's only $20 more. Add $5 shipping/handling.

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Digital Digest

AMTOR

by Norman Sternberg, W2JUP
279 Adirondack Drive • Farmingville, NY 11738

★ Operation & Performance Characteristics ★

This article is dedicated in gratitude and fond affection to J. Peter Martinez, G3PLX, who early on took pity on this aging writer, helped me "learn my craft", and graciously gifted me with his hospitality during the long months I lived and worked in the United Kingdom. But for Peter's selfless dedication, our fraternity might never have gained the fascinating mode we call "AMTOR". This article contains much information gleaned from Peter's expertise and patient efforts.
- Norm Sternberg, W2JUP/G5ECI

ASYNCHRONOUS VERSUS SYNCHRONOUS TRANSMISSION

Since the beginning of electromechanical telegraphy and teleprinting, maintainance of the proper timing relationship between the sender and the receiver has been resolved by mechanical synchronization methods. These were based on the basic ideas of "start-stop" telegraphy. The original Baudot rotary distributor permitted the sending distributor to tell the receiving distributor when the rotary contact was at a reference point in the rotation of the motor shaft. The distributor created a start and stop pulse at the beginning and end of each character.

In conventional teleprinter operation, each character has carried its own sync information in the form of the traditional "start" element at the beginning of each character, and the "stop" bit at the end of the character. In some systems, the "stop" element is one, one-and-onehalf, or two bits. The result is reduced efficiency - each character will have a fixed amount of "overhead". These housekeeping bits carry no user information. They exist only to keep the sending and receiving machines in sync. This reduced efficiency has kept a lid on higher data rates and has been a block in the constant search for faster ways of sending more information for more people.

As data processing requirements became more demanding, newer forms of synchronization evolved. A method was developed which applied a single synchronizing string to an entire string of characters, rather than include sync information in each character. The "overhead", or housekeeping bits previously inserted into each character for sync purposes were eliminated; higher data rates became practical, without sacrificing data integrity. This newer method, called "synchronous" transmission, is used in higherspeed and specialized forms of transmission, including both SITOR and packet radio. Even though your terminal keyboard sends your packet controller (or SITOR system) asynchronous data, with start and stop bits in each character, packet controllers and SITOR converters strip the start and stop bits from your characters.

SITOR - ERROR-CORRECTING TELEPRINTER OVER RADIO

In this paper, we'll use the term "SITOR" as a generic reference to AMTOR and various applications of the same error-correcting radioteleprinter system.

SITOR - DEFINITIONS & STANDARDS

- SITOR (Simplex Telex Over Radio) is the name applied to a method of error detection and correction defined in CCIR Recommendations 476 and 625, for Direct Printing Telegraph Equipment in the Maritime Mobile Service.
- AMTOR (AMateur Teleprinting Over Radio) is the name derived by the Amateur Radio fraternity to describe the SITOR system as modified and applied in amateur radio operation. AMTOR is authorized by the FCC for the Amateur Radio Service in Part 97.309 (a)(2) of the Commission's Rules, and must comply with CCIR Recommendations 476-1 (1978), 4763 (1982), 4764 (1986) and 625 (1986).

  Our references to "ARQ" and "FEC" will encompass both SITOR and AMTOR.

GENERAL SITOR CONCEPTS

When high-frequency radio is used for teleprinter telegraphy, the mutilation of data bits is normally much worse than with land-based telegraph circuits. HF radio is subject to severe fading and distortion, especially in times of high sunspot activity. Because of its high error rate and general unreliability, its use is avoided insofar as possible for the transmission of computer data. However, HF radio continues to be widely used by highseas vessels in ship-to-shore teleprinter and telex links, and in many isolated areas.

HF radio links can frequently produce an error rate (before any correction) of many characters per thousand. The mutilation rates can rise as high as one character in forty, or even as high as one in four on very bad links and at certain bad propagation and multipath times.

The transmission of information over HF radio can be protected against fading, noise and other disturbances by use of an "ARQ" system (Automatic Request for Repetition). SITOR equipment, also known as "TOR" (Teleprinting On Radio) prevents messages from getting wholly or partially lost.

FIRST PRINCIPLES

The use of a special transmission code permits the receiving system to determine if a character was garbled or mutilated during transmission.

There are 32 recognizable characters in the Baudot-Murray teleprinter code traditionally used for radioteleprinter and landline telex systems. These characters are normally transmitted by 32 combinations of five data bits. If five data bits are used, then any bit error will transform one character into another and the error will pass undetected.

THE SITOR CODE

SITOR uses seven data bits, thus allowing 128 possible character combinations, of which only 32 are recognizable printing characters. Careful choice of which 32 are used minimizes the possibility of an undetected error.

Only those combinations with three zeros and four ones are used, making it easy to check for errors at the receiving end. There are 35 such combinations or codes in CCIR Recommendation 476, and 37 characters in Recommendation 625. These extra bit sequences, available for control purposes, are:

- Control Signals CS1, CS2, CS3 (plus CS4 and CS5 in R.625)
- The idle Beta character
- The idle Alpha character (phasing signal 1, R.625)
- The RQ signal repetition character (phasing signal 2, R.625)

The CS1, CS2, CS3, CS4 and CS5 control signals are also seven-bit characters from the same set. Because these control codes are always sent only in the reverse direction, they are never confused with the others. Note that this code is designed to translate easily to and from the Baudot Murray code.

When the receiving system decides that the received character is mutilated, the output of the SITOR system is blocked so that the mutilated character is not passed on to the teleprinter or terminal. At the same time, a repetition request (RQ) is automatically returned to the station that sent the character.

The repetition request is made with the aid of a specially-designed transmit and receive system. When such a request for repetition is received at the transmitting station, it starts a repetition cycle to the effect that a group of last-transmitted characters (including the mutilated one) is retransmitted.

SITOR PROTOCOL - MODE A "ARQ"

In the SITOR mode (A) or ARQ, Station A sends burst of synchronous frequency-shifted data containing three seven-bit characters. Station B, in response, sends the acknowledgement signals in the reverse direction as a single character. How, then, can ARQ solve the communication problem? The answer lies in encoding the acknowledgement signals differentially using two control characters called CS1 and CS2.

When Station B is copying correctly, receiving valid characters, Station B replies with CS1 and CS2 alternately after each block. If a bad block is received, Station B repeats the same control code as the last time. If Station A sends "Please repeat," then Station B repeats the same control code as the last time. Thus Station B's reply is the same for a "Please repeat" block as for an error. It doesn't matter, therefore, if the bad block was a "Please repeat" block.

To prevent confusion, the changeover in direction of transmission is not left to the operators; there could be a misunderstanding if the link fades out just before the expected end of a transmission. There are two ways to signal for the changeover:

- The sending station can end his transmission with the two-character sequence '?
- The receiving station operator can press the TRANSMIT button.

By either method, the receiving station stops replying with CS1 or CS2 and instead acknowledges with CS3. Upon receiving this information, the sending station transmits the block "beta-alpha-beta". In response, the receiving station transmits an RQ character, whereupon the transmitting station goes to the receive mode.

Bursts of data from each station are so timed that even if both are transmitting blocks momentarily, each one can still receive one character of the other's block in the position expected to be a control code. This seemingly complicated process does ensure that the changeover proceeds in an orderly manner and cannot go awry, no matter what.

Timing of the various signals is shown in the figure, with some of the possibilities for errors. Note that the two stations do not behave identically in respect to timing. One is called the "Master" station and the other the "Slave", for reasons which will become apparent shortly.

SITOR PERFORMANCE

Although ARQ, in common with other error-correction systems, almost completely eliminates errors resulting from the radio link, it is worthwhile pausing to see exactly just how good it is. A simple analysis can be made by supposing that the radio link alternates between perfect copy and perfect random noise. With only noise in the receiver, all 128 seven-bit patterns are likely to be received with 34 of these being acceptable (the RQ character is treated the same as an error).

Thus the chances of a whole block of three characters being accepted by mistake is (34/128)3 or about 1.9%. Therefore, with no signal, the receiving terminal will be idle for 98.1% of the time while the system is asking for repeats and will be displaying garble for 1.9% of the time. This compares with 100% correct copy when the signal is good.

By using the foregoing information, we can calculate the proportion of garble to good copy for various proportions of good signal to bad. A similar analysis for the reverse path shows that when there is no signal in this direction, 0.8% (1/128) of the message is unwittingly lost into thin air. The combined effect of these factors is shown in Table 1.

SITOR PERFORMANCE (Table 1)

The assumption is made that the signals in both directions alternate between perfectly good and perfectly bad.

Percentage of Time Signal is Usable	Percentage of Transmitted Message Received Correctly	Number of Spurious Characters Printed as Percentage of Transmitted Message Length	Time Taken as Multiple of 100% Signal Case
100	100.0	0	100.00
90	99.9	0.2	1.11
80	99.8	0.5	1.25
70	99.7	0.8	1.42
60	99.5	1.2	1.66
50	99.2	1.9	2.00
40	98.8	2.8	2.50
30	98.2	4.4	3.30
20	96.8	7.5	5.00
10	93.0	16.9	10.00
5	85.2	35.6	20.00
2	61.7	91.8	50.00
1	22.7	185.5	100.00

SITOR SYNCHRONIZATION

Considering that SITOR is a synchronous system with no start and stop bits, the timing at both ends must be stable. Some means must be found to get the two stations in step and to keep then that way over a period of time, even if the two clocks are only slightly different in speed.

The synchronization procedure starts with the first station (the master) sending a special synchronization block repeatedly. The slave station continually shifts in received bits until 21 consecutive bits correspond exactly with the expected synchronization pattern. The slave then starts to reply in the gaps, sending back one of the control codes.

The master station, meanwhile, has been shifting in received data bits during the gaps in its transmissions. When it recognizes two consecutive control codes, it stops sending synchronization blocks and changes to sending traffic. In fact, to guard against the possibility of the slave getting the synchronization pattern right just by chance, the master sends two different synchronization blocks alternately, and the slave must get them both in order to lock in correctly. The first of these blocks has an RQ in the second character, with two alphabetic characters in the other two positions.

At the same time, the second block has two more alphabetic characters in the first two positions with an RQ in the third. The RQ characters prevent the four alphabetic characters from printing out at the slave station. These four characters can be chosen by the users, but must be agreed upon beforehand by the operators at the two stations concerned.

In SITOR, the commercial maritime service, these characters are derived from the ship's identity number (or perhaps telex number), and form a selective-calling code, or SELCAL. As used in the Amateur Radio Service (AMTOR: AMateur Teleprinting Over Radio), the four-character group selective-calling code suggested for all random communications is derived from the call letters of the station.

To accommodate any slow drift in timing between the two stations after initial contact, the slave station monitors the timing of data transitions received from the master. If these tend to drift away from the optimum point, i.e., halfway between the adjacent sampling instants, the local clock is shifted to correct this.

(cont'd on page 17)

Packet Radio - The User Interface (Lan-Link)

by Joe Kasser, G3ZCZ • P.O. Box 3419 Silver Spring, MD 20901

Introduction

The majority of the thinking and the software development in Packet Radio to-date has been in the area of the BBS and in message handling. Everyone assumes that messages exist yet ignore how those messages got into the packet radio network in the first place and how they get out of it later. This article addresses that neglected aspect of the genre; in other words, the User Interface or the Personal Packet Terminal Program (PPTP) and the environment in which it resides.

The Packet Radio Medium.

The Packet Radio Medium consists of what is happening in a given local area on a frequency channel time-shared by a number of amateur radio stations. It is a multiple access or distributed situation which has so far been treated almost the same as a single point-to-point situation such as the telephone line. Unlike in a telephone based network, many of the stations in the network can, in real time, see information passing between other stations in that network. (1,2) Whereas the telephone based net may be considered as a centralized network in which everyone on it is connected to a single host. The amateur radio packet Local Area Network (LAN) is spread over a geographical area and should be considered as a distributed network.

Packet Radio software to-date has been designed for a one-on-one connection ignoring the one-on-many capabilities available in a distributed LAN. Consider the medium itself, Packet Radio is an ideal MESSAGE MEDIUM. While there is place for keyboard operation, Packet Radio really shines when passing messages. The Packet Radio operator is really interacting with the LAN. The TNC and PPTP can be considered as a single element between the human operator and the LAN, so that any discussion of the user or human interface must take into account activity on the LAN.

Packet Radio LAN Capability

VHF Packet radio systems can be considered as part of a LAN in which messages can be left by one station in a computer belonging to a second station. On HF the same is true, but the area of the LAN becomes greater.

The fundamental problem within the LAN is that people can only send and receive messages to or from any specific station when that station is on-line. To compensate for this, Packet LAN development parallelled that of the centralized telephone network. BBS stations were developed which allowed both messages and bulletins to be stored for later retrieval. As the requirement for bulletin messages is real in the Radio Amateur environment and the centralised LAN concept meets the requirements of both bulletin and point-to-point messages, the distributed LAN approach for point-to-point messages in the main seems to have been ignored.

Most Amateur Packet Radio Stations use computers to interface the TNC to the LAN. As there is all this computer power sitting in the shack, why not take advantage of it. Let us include within the PPTP software, which takes into consideration both the characteristics of the distributed LAN and how optimum use can be made of them for the user.

The User Interface.

This is defined as what the user types at the keyboard and sees on the screen of his computer when it is connected to a working TNC which by definition is part of the LAN. When somebody first gets a TNC, he gets a 'black box' which comes with a manual that seems bigger than the box itself. The instructions on how to connect it to a transceiver may be easy enough to follow, but then the instructions on what to type and when, are a nightmare. The TNC can operate in a Command Mode, in which you tell it to do something, or in a Converse Mode in which you are using it to pass text of some kind to other stations. Many newcomers confuse the two TNC modes. If you monitor the packet channels you will recognize command mode TNC instructions on the air, and when you use the TNC, well I'm sure that you still get, now and again, an 'Error' message when you type something thinking that you are in the Converse Mode but are really in the Command Mode.

The Personal Packet Terminal Program (PPTP)

Most of the commands that affect the parameters within the TNC are normally never touched. In fact once 'CONNECT', and 'DISCONNECT' have been figured out, and the difference between the Command and the Converse Modes (and how to get from the one to the other) are understood, the newcomer is able to use Packet Radio. From this time on he rarely uses any of the other TNC commands with the possible exception of 'MH'. Even the ones that should be adjusted when changing from VHF to HF operation most often never are.

From a human factors point of view, Packet Radio under these conditions is disappointing. Tests have shown that the attention span of a person sitting at a terminal is about 2 seconds. In coventional RTTY, or AMTOR operation, the data communications rate might be slow but at least something is happening all the time. In keyboard to keyboard Packet Radio contacts, often minutes seem to pass before the next packet shows up on the screen.

The PPTP's most commonly used at present on PC's are either YAPP (3) or conventional telephone modem driver programs. There is no smart PPTP. The need for "smart" PPTP's is however being perceived. The Mini BBS seen on the air is one example. Another example noticed in London and in Israel, is that stations equipped with IBM PC's or clones start off by using BBS programs as their PPTP. On one evening in London in August 1987 G3RWL taped about 10 BBS's, point to point direct connects, stations doing multi digipeat connects to other stations as well as to the BBS's all on the same channel and all using it simultaneously. It is a wonder that any traffic got through.

A PPTP program written in Turbo Pascal, named LAN-LINK, that is optimized for the radio amateur LAN has been developed for the MS- DOS, IBM PC series of microcomputers. Although first written for the AEA PK232 Multi-Mode Data Controller, taking advantage of some of the specific commands built into the PK232. It has since been modified so that most of the PPTP Packet Radio functions will also work on a TNC2. The following list contains much of what this PPTP does both as the user interacts with it, and how it performs LAN related activities.

- Menu Driven and Function Key Control
  The commands to the TNC lie somewhat in between a mixture of operating, configuring and debugging. This PPTP relieves the user of figuring out how to tell the TNC to do what he wants to do. It takes advantage of all the computing power at the user's fingertips (literally) and uses software which may be located either in the TNC or in the PPTP, but is totally transparent to the user. The user in fact never has to tell the TNC to go into or out of the command or converse modes. The user tells the PPTP what he wants done by means of menus or function keys, and the PPTP figures out what to tell the TNC to do the job.

(cont'd on next page)

- Terminal modes.

There are four single connect modes two multiple connect modes of operation, as follows.

1 SOLO
In this mode, you will only see messages addressed to you. You will only get messages from people who connect to you. (This corresponds to 'MONITOR OFF').

2 TRAFFIC
In this mode you will see most of the traffic on channel. You can use this mode to check that the TNC is working. (This corresponds to the PK232 'MONITOR 4' (4) or 'MONITOR ON').

3 CQ/BEACON
In This mode, you will see CQ and BEACON packets on the channel. (This corresponds to the PK232 'MONITOR 1' and only works on the PK232.

4 READ THE MAIL
In this mode the terminal is set to display the contents of packets without the headers for selected stations. Apart from being able to copy both sides of a QSO, you can read the mail on a BBS or other stations and get BBS bulletins without connecting to that BBS yourself. This cuts down on the number of messages sent on the LAN, since more than one station can copy the same Bulletin at the same time. This corresponds to 'MONITOR OFF' and 'MBX' <callsign> and only works on the PK232.

5 MULTIPLE CONNECT CAPABILITIES
Advantage is taken of the 10 I/O streams in the TNC for multiple access modes as follows;

5.1 The Individual Multi Connect Mode
This is the normal Multi Connect Mode as described in the TNC manual. Here you are connected to up to 10 stations and will send different traffic to each of them. Each time you wish to send something to a particular station, you must select the IO channel the station is connected on before typing the text or sending the file.

5.2 The Conference Multi Connect Mode.
In the Conference Mode on the other hand, everything that you type at the keyboard is transmitted to each station that you are connected with. Thus if you are linked to two stations each line will be packeted twice by the TNC. You don't have to worry about sending the wrong thing to the wrong person, as they will all get the stuff. This mode should be ideal for DX nets, 'contest spotting' and public event support.

- Automatic Answering Machine capability with display of message queue.

The PPTP incorporates a smart "answering machine" facility. You can leave messages on your system for different stations. When someone connects to you, if you left a message for him, he (or she or even it as the case may be) will receive it automatically. No one else should normally be able to download that message. To ensure that people know that you have left a message for them, a 'MAIL for' list is loaded into your Packet Beacon and transmitted every 30 minutes. If no mail is pending then beacon transmissions are inhibited. This conforms to good operating practice on crowded channels (at least inhibiting the beacon does).

- Automatic Capture-to-Disk

All traffic received during connects is stored onto disk. Provision is also there for manual capture of any traffic monitored on the screen.

- Automatic logbook entries for Connects.

All connects are logged into a separate logbook file. The Logbook file is capable of being processed by a database Logbook Package.

- Printer on/off control.

The PPTP can print incoming information and will automatically shut off the printer on disconnect.

- Alert signal

The PPTP contains an Alert function to let you know when someone shows up on LAN. It is active when disconnected and the terminal set for 'TRAFFIC'. The PPTP scans the packet headers received from the TNC, and, when it sees a packet originated (or digipeated if the MRPT parameter in the TNC is set to 'ON'), by the station whose call has entered as the 'Alert' call, sounds an alarm at the console. The Alert function should (but can't be without getting at the TNC firmware) be independent of the terminal communications mode.

- Indicator that a specific station designated as the 'target' call connected while you were away.

This function saves you dumping the capture-to-disk file to check if traffic has been received from a particular station who promised to send you some data that you need urgently.

- Split screen terminal display, at least 3 Windows displaying Incoming text, Outgoing text and Status Information.

The Status information includes the call of the Station you are connected with (if any), PPTP mode and status, number of connects, number of messages outstanding, PPTP configuration, Alert and Target calls.

When the PPTP sees a connect by the station whose call you have entered as the 'Target' call, it sets the flashing Connect Counter display to show a 'happy face'.

- Simplified keystrokes for connect paths and loopbacks.

Connect path information may be stored in an ASCII text file (LAN-LINK.DIR which is compatible to YAPP.DIR (3)) in the following format.

```
Alon 4Z4ZB V 4X6AA
Milt 4X6AA
LR 4X6LR
hf-il 4x4hf v 4z4zb 4x4il
hf-rj 4x4hf v 4z4zb 4z4rj
```

The PPTP can also perform automatic NET/ROM and KA-Node path set up from the LAN-LINK.DIR call/path directory file. You create this file with your wordprocessor in its non document mode. You must leave AT LEAST one space character between the key word and the connect path. When you attempt a connect, the PPTP scans this file to see if what you typed matches one of the key words (first word) on any line of the file. It also ignores the case of what you typed in. If it does not find the key word, it will try to connect with whatever you typed in.

A LOOPBACK is when you connect to yourself through someone else. You should use this to test a connect path when the station you want to connect with is connected to a third station. Instead of causing QRM to him by trying to connect to him and getting a 'busy' signal if the path is good, loopback using him as a digipeater to test the path. The loopback should be performed with a minimum of keystrokes. Thus to loopback through K8PNW you just have to use the regular PPTP function key that does the connect operation (Function key 7), but type '/K8PNW' (slash /callsign) instead of (yourowncall) via (callsign)).

- Path determination to Dx station.

On VHF, if you want to establish a digipeat path to a station somewhat out of your direct range, you need to know which of the stations that you can connect with can hear that desired DX station. If you could get a call monitored (MH list) from the stations that you connect with, you would be able to see if the station you are connected with has heard your desired DX station. Thus as the TNC can't do it, the PPTP is capable of being triggered to send its 'MH' list to the connecting station. By judicious use of this capability you can determine paths to other stations. Note however, that just because one station can hear another station, it does not mean that it can work it. For example, the station you are connected with may be using a power level of 1 watt or so, while the station 200

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BITS & BYTES

by **Lacy McCall, AC4X**

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YOU MAY NOT KNOW IT, BUT ...

"You were country before country was cool!" At least most of you were into the age of communications, long before it was so popular and before space on the frequency spectrum was in such demand. What you see around you (and me) is a world waking to the benefits of good communication. As I have noted before, it is both good and bad. Most people outside the amateur radio community never understood exactly what it was that made a HAM spend all weekend and many late hours "playing" with all those radios.

In this column in recent issues, I've tried to look at both the past and the future. Now, let's look at the present. The future and speculation about it will be up to you.

Today, you can drive down any busy street in any city and see the driver next to you using a cellular telephone. I can remember when it was called a "mobile" telephone or a "radio" telephone. Many times, the guy talking will be doing just like you and other hams using two meters. He will be focusing on the conversation and only putting a small part of his mind to work driving. As we both know from listening to repeater chat over the years, it is not uncommon for drivers to stop in mid sentence to correct the steering wheel or swiftly apply the brakes.

What is different about the new cellular car phones, is that you not only see business men, busy trying to close some deal or other, you see mothers "talking madly" as they pick up the carpool at school, or stop at the grocery.

When the MOMS take up communicating and using valuable frequency space, you had better look out. They may really get an appetite for such things and then we can enlist them by offering "nocode-low-tech-just-talk". You can imagine what would happen if the average housewife began to dismantle a broken cellular phone. She would be in even worse shape than most amateurs looking inside a compact vhf radio.

One thing I've vowed is to preserve is the quiet in my automobile. I love to chat with an interesting person and I use the telephone constantly to communicate with others. Occasionally, I don't even mind if someone calls me at home at night, so long as it about something important like my hobby; but, please don't let a phone get near my car. With a twometer rig, I can listen if I want and I can "not answer" if called. Most important, I can turn it off or leave it at home if I wish. It is a tragic thought that a telephone could ring in my car and spoil all that privacy.

A couple of months ago, while on an airplane departing Atlanta, I was lucky enough to be seated next to a business man from that city. As soon as he was seated, he promptly opened his brief case and extracted his cellular phone and proceeded to call everyone he knew and probably a few people he didn't. I am sure most of the people he called were impressed, because he explained in detail to each person that he was on a Delta flight at the airport and was on his way to Washington. He left no doubt that he was on a moving aircraft, so that his victims could be certain that he was not using a simple payphone.

Now this guy wasted a lot of radio frequency energy. I tried not to pay attention, but my ear was only about a foot and a half from his mouth. Of all the calls he made, it did not appear to me that any of them were very urgent. Just "touching base" as the Valley Girls say. (If you don't know what a "valley girl" is, ask a friend!).

Enough talk about the wasted spectrum. We're discussing NOW and if it is wasted, it is just that. What we need to do is look around a bit. As a society, we have become accustomed to instant communication. Since we saw the Iranians on "NightLine" each night during the hostage crisis, we expect everything on a real time basis.

Society has caught up with you and me. We were talking to the USSR and Iran on a real time basis, long before te age of the satellite and the big dish tv antennas. If you have been a ham for very long, you were a communicator before communicators were cool, but the rest of the "country" is catching up fast.

ALL THAT POWER ...

My computer is a 20 megahertz 80386 and my car is 1990 Nissan 300Z. Next you will ask the question about "fast women" that I decline to answer. The car and the computer, have a lot in common and tell us more about where we are today. I'll try to refrain from any psychological analysis and offer only observation.

The car has a lot of nice features, is very fast and is a fine example of current technology. It rides and handles beautifully and I have read that it will do 147 miles per hour. Now, I am no prude and in my younger days, liked to drive a little faster that the law would permit. Even today, I might get just a little illegal sometimes, but what I've been trying to figure out is, where I can go to actually drive the reported top speed. I bought the car and I understood all this before I plopped down the dough, so don't think this has just occurred to me. I like the possibility of going 140 miles per hour, if I want to, but heaven forbid that I should ever loose it enough to do so.

What Nissan has done is to build a car that delivers a lot of satisfaction to it's owner, but that has considerable potential beyond what any normal owner will use or ever be able to use.

The same is true for the computer. The 80286 and 80386 have a system of using memory which is called "Protected Mode". The chip designers envisioned a method for multi-tasking that would allow much more memory to be used. The memory for each of many applications running simultaneously, are "protected" from other programs. The trouble is that just like the speed limit, standard DOS does not have any capability to use this mode.

In both the cases noted, and in many others you may see if you spend a while looking, we are producing highly innovative products which have more potential than we will ever be able to utilize. Our designers are just a few jumps ahead of reality and maybe the buyers like that.

AND SO ...

While we're on or near the subject of computers, let's take a look at where we are in that arena. No predictions are necessary. Compaq has just advertised a 33 megahertz 386 personal computer. They are one of the many companies betting that the standard initiated by IBM will be around a while. Yet, IBM is bombarding us with PS/2 ads. It's a well documented story that IBM created the standard, and has now moved in another direction, after the world has been filled with PC's.

The case can be made that the IBM PC-platform is not acceptable for the advances we know will come. It is certainly true, that the PC has many shortcomings, such as the memory addressing limitations. Some of these, however come from the co-partner in crime, MS-DOS. The DOS standard, just like the PC standard, has left us a little boxed, but many "work-a-rounds" like Expanded and Extended Memory (EEMS) have come to the rescue, allowing further hardware and software advancement.

What we see now, is a large user base of PC machines, doing a lot of work and some play. We see a product tree with some new and budding branches like PS/2. It will be interesting to see how the entrepreneurs in the corporate world deal with the dilemma between new frontiers and the established user base.

WHAT ABOUT DIGITAL ...

All the above has a lot to do with your everyday use of digital communications and where it may lead in the future. It also may let you stop and look at where you want to go. Here is one example. Not long ago, if you wanted to operate RTTY, you

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had to have dedicated equipment and a terminal unit. Now, you can operate RTTY, with the same TNC you use for Packet or Amtor. This very day you can put an all mode station on the air, using the same computer to control all the modes of operation. This even includes controlling the functions of the transceiver. It is a great time to check out all that is available and many are doing so. Listening on the bands, you will hear many more Amtor and Baudot signals and that means more contacts for anyone interested in those modes. It is very easy to spend an evening tuning the bands for new digital signals. These include FAX transmissions that are easy to copy. Many digital devotees are not only hams but short wave listeners and many a ham started out tuning signals on a shortwave receiver.

The other advent, is very good software to control all the hardware. The BBS systems, terminal and logging programs, and the control programs are there for you to use. You should take time to ask those you contact using the digital modes, what their software is and how they like it. Usually it's inexpensive to upgrade to better and newer software that will make your hobby more fun.

WHERE DO YOU GET SOFTWARE ...

In my case, I use many of the most popular programs in my business. Long ago, I concluded that it was not a good idea to allow programs that I purchased or licensed as the case may be, to be copied and given to others. If a friend asks, I just explain that I prefer to buy my software and since it is used for my business, feel it inappropriate to copy it for others. It has very little to do with my morality. I just believe that if I want to continue to see better and upgraded software, the authors should be allowed to sell their programs.

On the other hand, it irritates me to have to fool with any program that has some method of copy protection. Therein lies the dilemma. I don't like or want copy protection, but I do want the authors to be compensated.

None of this has anything to do with the wealth of software available in the public domain. This is free to all and some of my programs are offered to hams for the price of downloading, or the cost of a disk. What it does have to do with are those who try to make a living writing software for hams.

To put it bluntly, I don't think most hams think twice about copying programs for others. That is one reason, I would not try to sell any of my software exclusively to hams, because after the first dozen or so are sold, the rest would just appear. You can argue that hams are no different; that is to say no more or less moral than the rest of the world, and you will win the argument.

I have no way of knowing how the several forms of "share-ware" have done with rewarding the authors, but it is a problem that we face. If we don't pay for the price of the ticket, it may be that one day, we won't have anyone around willing to give us a ride.

Take advantage of the free public domain software, but don't hesitate to invest in a good program if you find it. Also, use restraint about sharing what others should buy for themselves.

VIRUS UPDATE ...

Since I last discussed my computer problems, things have gotten better. Like getting over a cold, I don't know why. One precaution that I am now taking in response to advice from a friend, is to set all my DOS files (including COMMAND .com), to read only. If you use a program like the Norton Utilities, it is easy and only takes a minute.

NEW SOFTWARE ...

Most of my recent purchases have had to do with programming and may not be of much general interest. However, if you are into C programming and don't already use the "Greenleaf Comm Library", let me recommend it. The library is written by Greanleaf Software Inc. of Dallas, Texas, and is available for a number of C compilers including Microsoft and Borland. It offers functions for controlling up to 16 serial ports. Specific support is included for the various "Digiboards", "Quadram Quadport", the "Arnet Multiport" board and "Star Gate Technologies" boards. In the future, I expect we will be seeing a lot more about multiport serial boards and Greenleaf is ready to help you tame the monsters.

I have been so impressed with the Greenleaf Comm Library, that I just ordered their "Super Functions" based on the data furnished with the Comm Library.

TEASER OF THE MONTH ...

Recently, late in the day, my friend was hard at work in a motel room and was considering opening the first of the several beers iced down in the motel room lavatory. How deserving, he thought. He had been hard at work all day and had lots to show for his effort. Never mind the tired back, the tired eyes and the somewhat weakened initiative, brought about by all the serious concentration. He felt very good .... until he discovered that the bottles didn't have twist off caps. Ever happen to you?

WHAT DO YOU SAY ...

Not being located in a large metropolitan area, I sometimes loose track of where all the action might be. Please give me a hand and let me know the latest in your area. If you are seeing a surge in something new, if you've just discovered something you think worth sharing or if a problem is of note, please let me hear from you. I have a keen interest in what is going on with our hobby and need the help of interested readers. Without, consulting with the other contribuors to Digital Digest, I suspect the same is true. Please let us all know what you wish to see in print.

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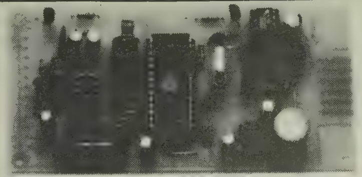

$50.00 PACKET (DIGICOM>64): a software-based packet radio system for the Commodore 64 by W2UP, Aug.'88 issue of 73 Magazine, page 22. The software is public domain and requires a simple modem interface to the C64 which is provided by our kit. The board plugs directly into the cassette port or remote mounted via a cable. A watchdog timer, reed relay PTT and PTT inversion options are included. Circuit power is derived from the computer and uses 7910 chip so no alignment is required. A switch allows HF or VHF operation. Order kit #154 for $49.95 or Assembly #154 for $79.95, both include free disc. Add $2.50 s/h.

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by **Peter G. Smith, N4ZR**

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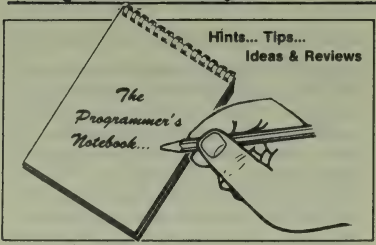
Hints... Tips...
Ideas & Reviews
The Programmer's Notebook...

I've just completed what, for lack of words that can be used in print, I'd call an enlightening experience. It all began when I volunteered for one of the Potomac Valley Radio Club's teams in the fall CW Sprint contest. For those who aren't familiar, it's a 4-hour contest sponsored by the National Contest Journal, whose key feature is that its rules require you to alternate roles between the called and the calling station. No big guns calling CQ hour after hour while the rest call them - instead, just 4 hours of chaos.

Anyway, last year, using my late, lamented Commodore 64 with my own integrated CW contest logging software, I made (for me) a reasonably good showing. There were some discomforts, because the software wasn't particularly suited to constantly switching from hunter to hunted, but it worked well enough. So, I figured, why not again? Only one prolem -- the Commodore had gone on to other ownership, and I needed something that would let me log and send cw with its replacement, my XT clone.

I looked at my inventory of software (I haven't redone mine for the IBM world), and realized I was in trouble. Nothing on hand would do both jobs - logging and cw - or even do the logging job for the Sprint contest exchange. So I reluctantly concluded that I would have to log by hand, but surely I could find a way to send cw. Well, yes, because my MFJ-1278 has a built-in memory keyer function, and according to the manual it even has automatic serial numbering. Of course, it requires that you press the (TAB) key and then a number key corresponding to the CW message, two keystrokes for each message, but I figured that wouldn't be too hard.

Wrong! Having to execute two keystrokes properly in order to send a stored message is at least five times as hard as having to hit only one. Miss the (TAB) and the thing just sends the number of the buffer! But the really diabolical part is that the serial number automatically increments each time the message buffer containing it is used. No repeats allowed! Combine these hassles with manual logging and duping for the first time since 1982, and you have some idea of the outcome. After a half-hour of frustration, I called it quits for this CW Sprint. Granted that the Sprint is a particularly tricky problem, but I simply couldn't do it. The mixture of computer and manual means, coupled with the particular problems of the "memory keyer", made it no darned fun.

Which brings me cleverly to the main subject of this month's column, the man/machine interface. Look in any computer magazine, and you find that a lot of controversy today revolves around how to make it easier for human and computer to interact effectively. Graphical interfaces, mice and trackballs, touch screens, you name it. I don't pretend to have any answers on that score that IBM, Apple, and all the others haven't found. But I do have some pretty firm ideas, based on five years of developing and evaluating contest logging software, about what works in this specialized context.

Herewith my five commandments for real-time logging software's interface to the operator:

1. Keep it simple - there's never time to dig back in the instruction book looking for the syntax of some unmemorizable command, or even to summon up on-screen help, and the program's operation must be as intelligible at four in the morning on the second day as it is at the beginning of any contest.

2. No crashes or cul-de-sacs allowed - This sounds pretty obvious, but most commercial software has some bugs. A good contest logging program has to be uncrashable through user error, and must not lead the user into dead ends. I once wrote and (blush) distributed an "upgrade" that would lead the user into an endless loop the 11th time a particular function was invoked. Anything that can be done, a contester will manage to do at some point during a contest, and the only solution is lots of careful, disciplined testing.

3. No surprises - the program must be entirely consistent in the way it acts. I remember one, for example, that permitted four spaces for QSO number. If you entered a 3-digit number, you had to tab to the next field. If you entered a 4 digit number, then the cursor jumped automatically to the next field without the tab. Imagine the confusion that caused late in the contest when many people you worked gave you either 3- or 4-digit numbers.

4. It must be entirely keyboard-controlled - trying to push a mouse around your desk while tuning your receiver and lunging back to the keyboard to enter alphanumeric data simply won't work. For the same reason, in CW contests, the CW must be sent from the keyboard.

5. Only one keystroke per function - since each one is multiplied hundreds of times by the time you finish a whole contest. I ran into one program that required you to press (ENTER) for each element in the Sweepstakes exchange, and then press another key to log the QSO.

A Practical Programming Example

In my experience, Sweepstakes is the most difficult of the major contests, from the programmer's standpoint. The main problem is the length of the exchange. You can't count on being able to log it all at once, on the first go-round, but you don't want to have to break it up into discrete elements, each requiring a separate (ENTER). My original solution was to copy the exchange as a single string, and then to strip off the multiplier (the section) from the end. The code to do that is shown in Table 1.

That was fine, as far as it went. No operator intervention was required to split off the section from the rest of the exchange, and it could then be matched, through hashing, against a master list of sections, marked to indicate which had been worked.

The problem arose when you failed to copy the section properly the first time or, worse yet, when you did not copy some other part of the exchange and had to go back and revise the entire string. With the screen editing provided by the Commodore (and by IBM for that matter) it was necessary either to type over the entire exchange or use the (INSERT) and (DELETE) keys to make room for anything to be changed or added. In the heat of a contest, that's pretty tough, although WB5BIR did make over 1550 QSOs in the 1988 Phone SS using the program in that form.

There is a better way - and it's relatively simple. Imagine a Sweepstakes exchange:

1011A WA4XXX 57 VA

Each of the meaningful elements of the exchange is either letter(s) or number(s), and they alternate! Assume for the moment that you will not want to type "NR" a thousand times, and that you will not re-enter the call-sign, since you've already entered it for duping purposes, and the program can insert it at the right place in the log. Then you have the number (a number), the precedence (a letter), the check (a number) and the section (more letters). That characteristic will let you write a smart entry routine that will automatically break the exchange up into its component parts for easy editing. Let's look at the programming (Table 2 written in Commodore BASIC):

The Programmer's Notebook (Table 1)

```
10 INPUT XC$                        Type in the SS exchange.

20 FOR I = 0 TO 5                   Inspect the last 5 characters
30 A$ = MID$(XC$, LEN(XC$)          in reverse order starting with
   -I,1)                            the last one; when you hit a
40 IF A$<"A" THEN 60                number (ASCII value less than
50 NEXT                             that of the letter "A"), stop.

60 SC$ = RIGHT$(XC$,I)              The section (SC$) will be the
                                    sub-string I characters long at
                                    the right end of the exchange.
```

The Programmer's Notebook (Table 2)

```
10 GET A$                           Get a character from the key-
                                    board.

20 IF A$ < "A" THEN                 If it's a number then go get
   NR$ =  NR$ + A$: GOTO 10         another.  Continue until you
                                    get a letter.  NR$ then is the
                                    string form of the number.

30 PC$ = A$                         PC$ is the precedence.

40 GET A$                           Get some more characters from
                                    the keyboard; as long as they
                                    are numbers, keep going.

50 IF A$ < "A" THEN                 CK$ is the check.
   CK$ = CK$ + A$: GOTO 40
60 SC$ = A$                         The first non-numeric character
                                    from the keyboard is the first
                                    letter in the section.
70 GET A$                           Get more characters from the key-
80 IFA$ >= "A" AND A$ <= "Z"        board until you hit one that is
   THEN SC$ = SC$ + A$: GOTO        not a letter (like a carriage
   70                               return).  That marks the end
                                    of the exchange, and of the
                                    section abbreviation (SC$).
```

... AND CONTINUING

Well, what this buys us is that we have the exchange broken into four components, without any requirement for the operator to discriminate them, and without any rigidity as to their length. Now we can display them on the screen and move among them easily for editing purposes. I would use the spacebar to accomplish this, with appropriate cursor placement commands. Finally, to log the QSO when the exchange is all copied properly, I would use a specialized key like (+) or a function key. Simple, quick, and predictable.

And Some Miscellany...

I've got my complement of software for the Fall contest season pretty well in place. For SS, I plan to use JCA Associates' Contest 300. Release 2.0 incorporates a new approach to embedded CW by sending character strings to an outboard CW generator, which can be any of the standard multimode terminal units (PK-232, KAM or MFJ-1278). It works just fine ... review next issue. If you want more info and can't wait, write Jeff (W2HPF) at P.O. Box 10404, Rochester, N.Y. 14610.

For CQWW (and ARRL DX, come spring), I will again use K1EA's CT -there's nothing better around. And for my 5-band DXCC, EASYDX Version 1.0 is now available, debugged and ready. Aside from a few quibbles, it's close to the ideal real-time logger and database. Makes even low-power DXing just as much fun as this evening's Sprint wasn't. It's all in the software, right?

Till next time, see you in the pileups!

(cont'd from page 5)

volunteer-based organization and extensive membership benefits."

Porter explained that applications for computers in ham radio include digital radio communications, network management, earth-based and satellite station control, video/FAX signal processing and a number of specialpurpose applications, such as propagation prediction, satellite tracking, recordkeeping and telemetry.

The group's plans include several technology-related projects, both hardware and software-based. In addition, an amateur Novice license class will be offered in the fall.

The Boston Computer Society is the world's largest personal computer user group with more than 31,000 members from every state and 57 countries worldwide. It is a non-profit organization dedicated to educating people about the uses of personal computers. Founded in 1977, the BCS has its headquarters in Boston. To join the BCS and the Amateur Radio Special Interest Group, send an SASE to:

Amateur Radio Special Interest Group
The Boston Computer Society
One Center Plaza
Boston, MA 02108

For further information, call Barry Porter, KB1PA, at 617-341-2639 or 617-769-6000 ext. 174, or Tom Walsh, KT1W, at 617-466-2392.

MFJ Enterprises, Inc....

announces the release of their new MFJ-1292 "Picture Perfect" Video Digitizer.

The MFJ-1292 gives you an easy-to-install expansion card for your IBM or compatible computer. You can plug a camcorder or video camera into your computer and use it to instantly capture digitized images onto floppy or hard disks. You can display these digitized "video snapshots" on your computer screen or add other graphics or enhancements to your pictures. Included software lets you create pictures in VGA, EGA, CGA, Hercules or Raw Data formats.

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TECH TALK from ICOM

Computerizing Your ICOM Station

Computer-interfaced transceivers are opening an exciting new dimension in on-the-air operations, and, thanks to ICOM's dedicated customer support, assembling your own computerized station has never been easier or more attractive! After interfacing your ICOM transceiver and home computer, DX'ing and contesting truly move into the "big league" category. You can control various rigs and their functions right from the computer or modify roles so the computer becomes your assistant operator. Using a readily available shareware program for ICOM transceivers, for example, you simply enter a contacted station's call into your computer system rather than writing it in a log. The system, in turn, logs the QSO using the computer's date and time plus your transceiver's frequency and mode. You are even alerted to duplicate or previous QSO's, needed countries for DXCC, desired states for WAS, antenna pointing directions, and much more. Exciting? Yes indeed, and this Tech Talk explains ICOM's tried and proven steps to assembling a smooth operating system.

Two logical questions during station planning are which computers and transceivers are good candidates for interfacing, and exactly what is involved in that procedure. Readily available programs supporting ICOM rigs are written for most IBM-compatible computers, and all ICOM multimode/base station transceivers are easily computer controlled. Interfacing consists of using ICOM's optional CT-17 level converter to mate your transceiver's TTL and the computer's RS-232 voltage levels, loading rig-controlling software into the computer, then ensuring software-selectable parameters agree with transceiver-interface switch settings. Baud rates of each unit must be set equally to exchange data, for example, and specific rig code numbers or "addresses" are necessary so transceivers and computers know "where to send their data." Confusing? Not really. Follow our suggestions and your chances of first time success will be maximized.

Begin by checking your transceiver's interface circuit and setting its related DIP switches for compatibility with your computer and software. These interfacing circuits are built-into ICOM's IC-765, IC-781, IC-761, IC-575, IC-475A/H, IC-375 and IC-275A/H transceivers. Their switches are factory preset for ICOM's suggested rig addresses and 10200 baud data rates as outlined in your owner's manual and reviewed in Figure 1.

ICOM's IC-735, IC-725 and R-7000 use a logic circuit-integrated interface. They have a fixed rig address, but their computer-interfacing baud rates are jumper or diode selectable. They are factory-set at 1200 bps but changeable to 300 or 9600 bps.

ICOM models IC-751, IC-751A, IC-471A/H, IC-271A/H, IC-1271A and R-71A must be fitted with their optional UX-14 parallel to serial data convertor unit. Before installing the UX-14, set its switches to specify your transceiver's address, band and baud rate as outlined in the UX-14's booklet and reviewed in Figure 1. S1's DIP switches 1 and 2 select baud rates of 300, 1200 and 9600 bps, switch 3 is set "ON" for transceiver operation, and switches 4, 5 and 6 select HF, VHF or UHF band operation. S2's DIP switches 1 through 6 set the radio's address in binary form with OFF equalling "0" and ON equalling "1."

Your computer's RS-232 I/O port and your transceiver's TTL remote control terminal are then connected to ICOM's CT-17 adapter. The CT-17's purpose is to convert your computer's RS-232 level, '+' and '-' 12 volts, to TTL level, +5 volts and 'O' volts. Finally, a transceiver operating program is loaded into your computer and the full setup is checked for proper operation. Initial problems or "bugs" are usually traced to different software and DIP switch-selected parameters. Remember the UX-14 fits several radios, and its S1/S2 switches must be set before installation.

If you experience transceiver or computer interfacing problems or have difficulty locating ICOM-related software, ICOM's customer service hotline at 206/454-7619 stands ready to assist you all the way. Computer-interfaced rigs are the future and, as usual, ICOM continues developing tomorrow's dreams into today's realities!

	ICOM MODEL NUMBER	COMPUTER ADDRESS NUMBER	S2 SWITCH SETTINGS (Binary Count)						S1 SWITCH SETTINGS 1, 2 depend on your computer's baud rate.			S3 SWITCH SETTINGS 8=TURN ON FOR TRANSCEIVE 9, 10=BAUD RATE						
			1	2	3	4	5	6	4	5	6	1	2	3	4	5	6	7
UX-14 REQUIRED	IC-751/751A	28	OFF	OFF	ON	ON	ON	OFF	OFF	OFF	OFF							
	IC-471A/H	34	OFF	ON	OFF	OFF	OFF	ON	ON	ON	OFF							
	IC-271A/H	32	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	ON							
	IC-1271/A	36	OFF	OFF	ON	OFF	OFF	ON	ON	ON	ON							
	R-71	26	OFF	ON	OFF	ON	ON	OFF	OFF	ON	ON							
SERIAL INTERFACE BUILT IN	IC-761	30										OFF	ON	ON	ON	ON	OFF	OFF
	IC-575A/H	22										OFF	ON	ON	OFF	ON	OFF	OFF
	IC-475A/H	20										OFF	OFF	ON	OFF	ON	OFF	OFF
	IC-375A	18										OFF	ON	OFF	OFF	ON	OFF	OFF
	IC-275A/H	16										OFF	OFF	OFF	OFF	ON	OFF	OFF
INTERFACE INTEGRATED WITH LOGIC CIRCUITRY	IC-735	4	• Related addresses preset (fixed) at factory. • All baud rates factory-preset at 1200 BPS. • Jumpers/diodes used for changing baud rates. (Check Owner's Manual).															
	IC-725	40																
	R-7000	8																
NEW TRANSCEIVERS	IC-781	38	All parameters front panel selectable (See Owner's Manual).															
	IC-765	CALL	ICOM Customer Support for computer addresses and baud rate.															

ICOM America, Inc., 2380 - 116th Ave. N.E., Bellevue, WA 98004 **Customer Service Hotline (206) 454-7619**
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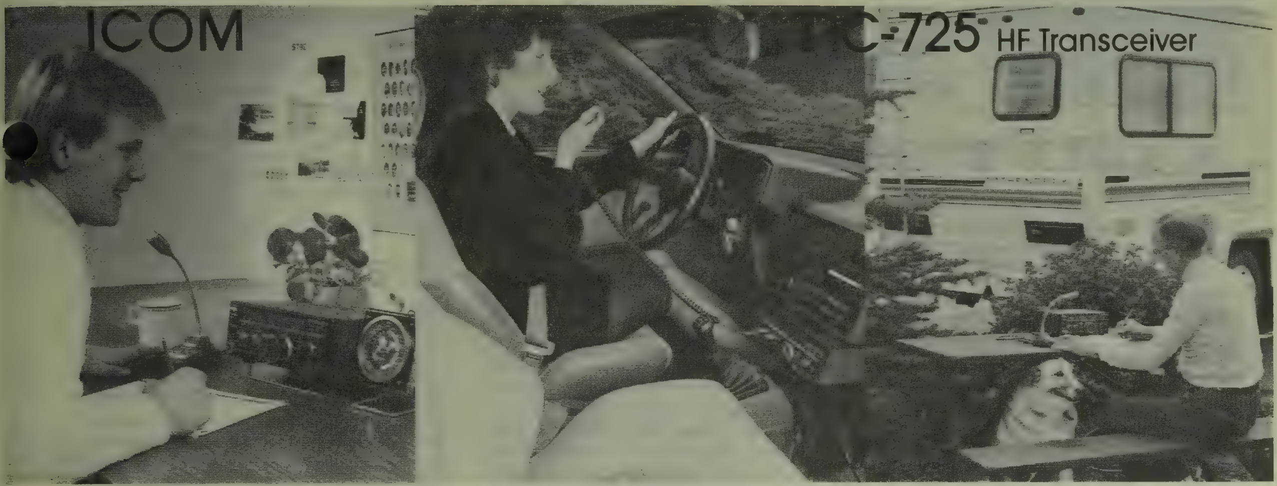

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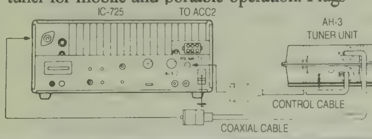

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Digital Digest

ACTION ON THE HAM BANDS

by **Jim Mulvey, KS1A**

60 Serenity Dr., Tewksbury, MA 01876

★ KS1A Breaks The Law! ★

I'm ashamed to call myself an extra. While the whole episode may now be a great conversation starter with the gang at hamfests there's still no way of getting around it. I, Kilo Sierra One Alpha, a self-proclaimed keeper of the amateur rules in every way I know how, broke the law. My weapon was my innocent multi-mode TNC.

A multi-mode TNC is truly a thing of wonder. My Kantronics KAM can do so many exciting things. Of course I wasn't content to just use it for the purposes of which it was created: AMTOR, HF & VHF PACKET, BAUDOT, ASCII and CW. Always the innovator, I had to push the envelope.

I suppose the seed of the idea came to my sponge-brain years ago. Sometime in the very early 1980's I learned of a ham who had automated his station! With wonder I learned that he had hooked up his Atari 400 or Commodore 64 computer to actually run his rig. At night while he slept his computer would make real CW QSO's with people! Then in the morning a printed list of the night's automated contacts would be waiting along with pre-printed labels for QSLs. The very thought of something like this intrigued me.

A short time later I learned of another ham who had an even more dramatic automated setup. A receiver in his room constantly listened through the static for the lonely beacons of amateur satellites. When a satellite came up over the horizon, it's beacon was picked up by the receiver. This in turn would make his whole room fly into action! The transmitter would instantly turn-on along with scanners and strobe lights. From a covered hole in the backyard would rise a tall mast complete with yagi's and rotors. The rotors would automatically point the antennas at the bird and slowly track it as it moved across the sky! Unlike the guy in the first story the actual contacts had to be made by the operator. (I guess you can't have everything!) When the satellite would complete it's path and fall below the horizon everything in his shack shut down. The pair of antennas would again point straight up to allow the mast to retract back into the hole. Everything would lay dormant until the next time that receiver picked up the beacon. Pretty cool.

So all of this stayed active in the background of my mind, waiting to surface when I bought my new TNC. The KAM has an excellent mailbox feature that allows people to connect and leave you mail. It was early one morning before work when I read about the mailbox feature in the manual over a cup of hot coffee, when it struck me.

Why had no one thought of this before? I wasn't new to HF packet and so I knew the routine. Nothing like my plan existed anywhere on the bands. Maybe I'd make the cover of one of the ham mags. Maybe I'd get my picture in the Up Front in QST section that always shows hams innovating! The gang on Compuserve and the nationwide HAM computer ECHO would be buzzing about me for weeks. Kenwood, Ten-Tec, Icom and Yaesu would fight over what which of them would get to stock the most new equipment into my shack! KS1A would join the ranks of other famous hams like G5RV, W2AU, W1AW and W4MPY. The plan was so perfect and exciting that it couldn't wait any longer. So it was that morning before work that I did it. The rig was tuned up on 40 meters on one of the packet frequencies and left on for the day.

You see, (my logic went) if I had the KAM call CQ all day while I was at work it is logical to assume that people would connect to me. Unlike the early automation experiments using CW where you had to be right on frequency to read the code, today's HF PACKET connections would assure a reliable callsign exchange. I activated my PACKET beacon to go on once every three minutes with, "CQ CQ CQ CQ DE KS1A--SPECIAL ROBOT STATION-PLEASE CONNECT." Once a station would answer my automated PACKET CQ, he would get my message, "I AM AN AUTOMATED STATION AND YOUR RST IS 599 FROM MA. PLEASE LEAVE RST REPORT IN MY MAILBOX HERE. MY QSL WILL FOLLOW VIA BURO! 73 de JIM KS1A>>" With everything running I proudly got in my car, flipped on my favorite repeater and headed down the highway toward work.

About 45 minutes into my trip I excitedly told everyone about my automation experiment. I told of wondering how many QSOs I could rack up doing this every day!

AND THEN THEY TOLD ME. YOU CANNOT HAVE AN UNATTENDED HF TRANSMITTER CALLING CQ ALL DAY LONG IN THE AMATEUR BANDS.

I don't even remember what happened next. The icy cold sweat of fear ran down my back as all the blood in my body rushed to my head. While I'd be at work my rig would be back at the house sending out a giant neon sign all day long that read, "KS1A is a LID!" How dumb can one ham possibly be?

Somehow my car exited and climbed back on the interstate in the direction toward my house. I was 45 minutes from home and terrible thoughts raced through my mind. The humiliation of driving up my street only to find dozens of FCC men crawling over my land while angrily looking at field strength meters made me shiver. The cold unsympathetic hand of the law taking my precious license and privileges away! "It was all a terrible mistake, Your Honor," I would desperately plead.

Of course I hit every major traffic tie-up while trying hard to get home. A mile from the house I got behind a late person's driving nightmare: THE DREADED SLOW MOVING OIL TRUCK! Then just blocks from home a swarm of school busses got in my way, each carefully stopping to load passengers at every driveway.

I flew into the house, over to the shack and turned off the transmitter. No FCC men were laying in wait for my return, but they should have been. I had blown it big time. What would the guys say to me at the next club meeting once this got around?

It's been six months since I broke the law. And while the statute of limitations probably hasn't run out on my perpetration I knew I had to tell this tale. The gang at the club and those on the repeater have forgiven me. For we all make mistakes, even Extras! Still in the back of my mind is that nagging quest for my own high-tech creative, original, ground breaking amateur-related legal innovation. Maybe someday I'll hit on it. By the way I had two honest to goodness automated PACKET contacts waiting for me when I got back to the house that morning. One of the QSLs arrived last week. I laughed out loud as I read the card, "To my dear American friend 'Automated'. You were 599. Thanks for the contact!"

Time To Renew!...

It's hard to believe, but we're almost to the end of our first year of publication. If you started your subscription at the beginning of the year, it means your subscription will expire with the Nov/Dec '89 issue. Don't forget to check your mailing label for the expiration date. If your label shows the numerals 89-6 (Year-issue#) then your subscription expires with the next issue. It also means we are looking forward to seeing your renewal in the mail. Don't wait til the last minute! We will not be sending reminders, so looking at your mailing label is important. To insure uninterrupted service, all 89-6 renewals must be received by the 15th of January, 1990.

(cont'd from page 7)

Thus, the slave timing follows exactly that of the master. The master uses the same technique to make sure it is sampling the signal from the slave at the optimum instants.

RESYNCHRONIZATION

Because timing drift correction is very slow in action, it is not easily disturbed by short periods of interference. But if contact is lost completely for some period of time, both stations must reestablish the correct timing by manual operator intervention - restarting the contact as if commencing a new communication session.

When both stations have been receiving errors or requests for repetition for 32 cycles of 450 milliseconds, then both stations will automatically return to the synchronization procedure, with the sending station retaining any unsent message in a buffer. The remarkable feature of the system is that it remembers which station was sending before the interruption, and when back in synchronization again, a change of direction is made automatically if required. The remainder of the interrupted message is then sent without gaps or errors.

If rephasing has not been accomplished within a period of 64 cycles of 450 milliseconds of continuous repetition, the link is considered to have failed. The system reverts to standby and no further rephasing attempts are made.

TIMING CONSIDERATIONS

CCIR Recommendations 476 and 625, which define SITOR in the international maritime radio service, specify the block repetition rate at 2.222 per second and the data rate within bursts at 100 bits per second. Thus, a block of three characters takes 210 milliseconds and a control code 70 milliseconds, leaving 170 milliseconds during which neither station is transmitting.

At first glance, it might seem like a good idea to allow the biggest margin of time for delays in antenna changeover relays, AGC and ALC circuits and the like, and to arrange the slave station to reply 85 milliseconds after the end of the master's transmission. The effects of distance between the two stations, however, cannot be ignored. This is particularly so for intercontinental communications.

The velocity of radio waves is 186.4 miles per millisecond (300 kilometers per millisecond). As a result, the slave station will receive a delayed signal from the master. The resultant reply will be received late at the master station by two milliseconds for every 186.4 miles (300 kilometers) separating the two stations. Thus, to make sure that this slave reply is not obliterated by the next master transmission on long distance communications, the slave must reply as soon as possible after receiving the signals from the master.

With practical equipment, and taking into account delays through various filters in the equipment, it looks as though 12,400 miles (20,000 kilometers) is about the maximum range for ARQ to function successfully. In other words, ARQ will just about cover the world on HF, at least by short path. But this generally rules out some satellite possibilities and moon bounce.

FEC - FORWARD ERROR CORRECTION - MODE B

In addition to ARQ, SITOR and AMTOR provide an alternate mode for situations in which the interactive or "handshake" operation is unsuitable. For example, FEC is the mode of choice for general broadcasts such as weather and press transmissions, traffic and message lists, emergency notices to mariners, and roundtable types of "network" operation.

In such cases it is clear that synchronization and "handshaking" cannot be established between one station and more than one other. Yet, the majority of services that use SITOR do have a definite need for such "broadcast" facilities. This is the role played by SITOR's FEC or Forward Error Correction mode. The form of FEC used in TOR depends on time diversity - each character is literally transmitted twice.

Instead of the usual bursty ARQ procedure, the sending station transmits the same character codes in a continuous stream, repeating each character twice. Each character is interleaved with the other characters, its second appearance delayed by precisely 280 milliseconds.

The first appearance of the character is analyzed for validity, and stored in memory if valid. If the character is invalid, it is rejected and an error symbol (usually a "space", an "underscore" or an "asterisk") is written into memory in its place. If the same character is validated and accepted at its second appearance, it is output to the terminal. If the second appearance of the character is also invalid, the previouslystored character is output to the terminal, regardless of whether it is an accepted character or an error symbol. Thus, a error symbol will be printed out only when both appearances of the same character have failed validation. The human operator can usually fill in the occasional missing characters found in a word.

The main point is that the terminal or printed page will not be filled with "garbage" or mutilated data. The station equipment can remain tuned to an empty, noise-filled channel without displaying continuous streams of garbled characters on the screen or page. Until valid data is received, the terminal will normally display nothing.

For the station operator, FEC operation is almost identical to conventional radioteleprinter or telex service; each station transmits in turn. The error detection and correction available with FEC is not as effective as that with ARQ. However, in those cases where ARQ is not workable because of multiple station circumstances, FEC's performance characteristics greatly surpass conventional Baudot-Murray and ASCII RTTY service.

Gordon West, WB6NOA...

says to go and make a buck on him! The popular west coast ham radio instructor has announced a plan that will reward hams who refer new students to his evening college classes and weekend radio courses. West's new plan rewards people he call's "ham Ambassadors" with a cash incentive to help promote growth in the Amateur Radio Service. WB6NOA says that he is proceeding with the cash incentive plan because "The ARRL continues to ignore the biggest ham radio marketing tool they have at their disposal, and that's their up-to-date cadre of amateur radio instructors and elmers." A press release continues by stating that he has decided to simply go around what he considers "the League's lack of a marketing program" by offering enterprising hams $50.00 over a year's time who recruit five prospective individuals into one of his weekend Novice licensing courses providing they successfully complete the course and obtain a license. He says he hopes this incentive will awaken others, including the ARRL, to the potential for growth in the service that is possible by providing the proper incentive for current hams to bring in fresh blood.

For more info, write:
Gordon West's Radio School,
2414 College Drive,
Costa Mesa, CA 92626.

-Source: WestLink Report-

Digital Digest...
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by **Mike Bryce, WB8VGE**
2225 Mayflower NW, Massillon, OH 44646

HAMRAD Logging Program

Hams generate a lot of data. I've always like to keep a good updated log book, even though the FCC requires just a bare mimimum of information be kept in a log book. I've always liked the idea of using the power of a micro-computer to reduce some of the work load in general logging. I've purchased some real dogs in my search for the ultimate logging program. However, there are lots of very good programs to use. This time around lets take a close look at one of the better programs out Hamrad.

Before we get to involved with the program, let me tell you what type of system I'm running the program on. It's a Tandy 1000 SX with 640K ram. The Tandy is running in the so called "Turbo" mode at 7.16 Mhz. The program is running on a 3.5 disk. The program was not installed on the hard drive. Operation would be of course much faster on the hard drive. But, I wanted to see how it would work with a minimal system. Hamrad requires 256K minimum user memory. A color monitor and CGA card adds to user delight, as the program is quite colorful. Hamrad will operate on one 360K floppy, but the log program would be severely limited. Of course, a printer will be needed for printing out the log sheets and the QSL programs.

The review program, Hamrad DSK3, contains version 4.01 software. Before starting the program, I copied all the files from the disk to my work disk, a 3.5 microfloppy. This is not only good practice, but mandatory, as we'll see soon. Hamrad is not copy protected.

Hamrad is NOT user friendly. You will have to print out the doc files from the disk.

Hamrad provides updates, including the latest revisions on a quarterly basis for $5.00 to any registered user. That's a offer you don't see to often.

Before I could do anything, I had to install the program. This is a bit different from the other versions of Hamrad. Installing the program is simple. Just follow the prompts.

You'll need to know your exact latitude and longitude and the serial number on the program disk. While you can change your mind as many times as you want, once you tell Hamrad that all is fine, Hamrad writes the file back to the disk. Now, lets say you made a error when you install the program. Say you input the wrong latitude. You can't go back and reinstall it. In fact, I tried to delete the install file and try again. No go! Hamrad writes a hidden file. You must re-format the disk and copy all the files over again. After that, you simply run install a second time. For those power users among us, a simple look at the disk with a utility program should find the hidden file and get rid of it. That way you would not have to go through all the trouble of reformating the disk over. Of course it would be just as well not to make any mistakes during the installation process.

After Hamrad has been installed, typing "Hammenu" starts things up and running. You are then greeted with the opening screen. Most of what you see does not require much thinking as to what each sub module does. From the Beam heading system to a DOS shell. The station master allows you to configure Hamrad even more to your personal equipment. I could change my call sign, should I ever decide too. Change my address, station equipment and antennas. For the printer, you can custom make your own printer driver. Also, I could change the default path for the data generated by the log as well as the default log. A very intensive little module. You want to go to the Station Master first before using Hamrad.

After leaving the Station Master, we can really get into Hamrad.

As the name implies, the Beam Heading module does exactly what it says, determines bead heading and distance from your QTH to a destination location. You have three options to find a beam heading. You can locate by international prefix, universal grid square or latitude - longitude. The easiest for me was prefix. I had a very good time just typing in prefixes to see how far they were from my home. To enter a prefix just enter a prefix such a BY. Hamrad tell me the country is China. Reference is Beijing. Beijing is only 6,767 miles from Massillon. Well I'm impressed! The screen also shows universal grid square, CQ zone, ITU region and Continent. Beam heading in short path and long path as well as latitude and longitude. If Hamrad can't find the prefix, it will ask you to extend the search. This deletes the rightmost characters, one at a time, from the entry until the first match is found. Of course you can use grid square or latitude and longitude, but for me I find the prefix search the best method.

The "ESC" key will move you backwards in menus and towards DOS. You can move from the Heading By Prefix to the Heading Program, back to the main menu by hitting the ESC key.

Another very useful module is the Print Heading List. There are several options available under this module. You can create a detailed list of all information held on file for all the prefixes in the data file. You can also create Quick Lists which detail prefix, country and short - path bearing. These lists can't be sorted by either prefix or country name in traditional alphabetical order. A Logscan option scans a selected log file and then prints a 10 band DXCC list with previously worked prefixes automatically checked off. When you are inputting data to the log book, I found out you must enter the frequency of the DX stations in band rather than frequency. For example. Instead of 14.023 you simply use 20 (meters).

Now for the meat of the program, the Enhanced Log Book. I used the default filename of MASTR.LOG. Hamrad has a Auto Search mode. Auto Search will cause the program to load ALL the calls with in the selected LOG file into user memory. Thereafter, for each entry into the log, it will search for a prior contact under the same call sign. If found, it will display the details of the contact record and allow for change to that particular enter. It will NOT allow a new entry with the same call sign. I found that feature both good and bad. I like to have Hamrad find a past call, but not allowing me to add a second entry under the same call is a real pooper! I like to be able to have several different log entries under the SAME CALL. For example. If I worked W8AU on 40 CW, I can't add a second log entry for W8AU on 10 FM.

After the log loads into memory, you have several choices. The first is to add, change or delete entries. Here entries are reasonably self prompting. Station Call, Name and so on. The frequency as

(cont'd on next page)

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Tel:(607) 748-9028.

mentioned before should be by band only if a DXCC list from the log program is to be made. The TAB key will move though all the bands, from 160 to 10 meters. I found out it is easier to key in the higher bands and not use the TAB key. Takes less work.

The date is entered without slashes, 090889, Hamrad reformats to 09/08/89. Nice! Other entries are self - prompting.

If you make a error inputting data, you have a chance to change it. You can not move about the data entry field with the arrow keys. This does slow things up if you type like me at three in the morning.

The other options are reasonably self documenting. You can sort the log by any or more of the field of entry. I sort by Call. You can also scan the fields. Say you wanted to see all CW stations that had a 459 RST. Hamrad will display those. You CAN'T print them though. Also, you have to print out the entire log book. You can't say, print out the last three pages. You must do the entire log. Since Hamrad prints quite a bit of info on the printer, 160 characters, some printers will not print correctly. My Tandy DMP 130 did not. My Gemini Star 10X did not print correctly either. Even after working and working with the driver codes with in Station Master. I even tried to write a small driver to set the printers to correctly handle the extra characters. My NX1000 works fine with Hamrad. A Epson FX series printers will work too.

I hate to make out QSL cards. Hamrad proves most useful in this area. You have your choice of either computer generated QSL cards or sticky labels to apply to your own cards. I for one never did like computer generated QSL, but Hamrad makes a good looking card on 3.5 X 5.5 inch card stock. You can change the default for cards, but this is normal postcard size. If you run the cards through the printer, turn them over and re-run them. Hamrad will place your return address on the back of each one. All you have to do is pen in the mailing address and stick a stamp on it.

Hamrad writes a hammy little phrase to the QSL cards. This can be changed from the Station Master or left blank. Also, you have to look over each card to be printed. Hamrad will not spool all the cards to the printer at one time. You can spool the data to disk however for later printing.

I myself like the sticky labels. Load the printer, ask Hamrad for labels and you're done! For some strange reason, Hamrad does send all the labels to the printer at one time. You don't get to ask for just one label of a certain call. That would be a nice to have feature if you wanted to QSL directly, without having to print out a few dozen labels at a time. In both the QSL card and QSL label programs, after the cards or labels are printed, Hamrad changes all the "Y" sends to "S" sent in the logbook. I might sound a bit picky, but Hamrad should ask for a trial label or two, to get the labels in the printer correctly. After that, print out the entire QSL file.

If you think we're done, well how about the CONTEST LOG. A real time dupe checker. It's fast and easy to use. The dupe checker will hold and dupe up to 6500 calls per band! If you need more than that, I'd like to hear from you. A great way tto log those sprints on 40 or 20 meters. You can import data to the regular Hamrad for sorting, printing or whatever.

And finally, there is the SUPER LOG. The screen fills with the outline of a QSL card. Prompts are very easy to follow. I find the Super Log faster to input data from my old log books than the Enhanced log book. You can use either one, as Hamrad writes to the same default file.

(cont'd on page 21)

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(cont'd from page 9)

miles away that it heard was using 100 watts. Test the path yourself, or/and leave a message asking about the reliability of the connect path between those two other stations. The DX station also may not be on-line all the time.

- Remote File Downloading

There comes a time when you want to leave a file on your system for someone to download later. For example, you have the latest AMSAT or ARRL DX bulletin, and you want to pass it on. You could pass it to selected people by copying the file to individual messages which wastes a lot of disk space.

On the other hand you could tell people that the file was available for downloading. You could do this either in the CTEXT connect message line which everyone gets when connecting to you, or in individual messages if you don't want everyone to know about it. The PPTP is not designed as a BBS, however it does have the capability for remote downloading of files.

- Automatic Count of, and indication of Packet connects.

The counter shows the number of connects made to the PPTP since you last reset the counter. Its a useful indicator of how much traffic has come in since you last looked at the screen. The counter is resetable by means of a function key.

- Digipeat monitoring and capture.

Although the TNC can digipeat on its own, there may be times when you want to know when you are being used as a digipeater and to capture-to-disk the contents of any packets digipeated through your station. (A typical example of this situation is when stations on your 'forbidden country list' digipeat through you and you may have a need to show what data was "exchanged".) This capability is in the PPTP.

- Capable of automatic connect attempts to snatch a QTC.

In the disconnected state, the PPTP monitors 'QTC' lists and when it sees its own call in one, automatically attempts a connect to snatch the message. In this manner there is no need to manually repeat connect requests to stations to whom messages are addressed in the hope that they have joined the LAN. When any station signs on to the LAN (ie the time when the equipment is powered up), it will, within 30 minutes, monitor a QTC list from every other station on the LAN and download its own traffic. In fact in an ideal situation, all one would have to do to "send" a message would be to leave it in one's own PPTP which would then set the QTC list in the Packet Beacon. The QTC—Snatch in the destination PPTP function would take care of the message transfer.

In the PACSAT environment, the QTC—Snatch function would be used to automate reception of messages at remote ground station sites. When the spacecraft is within the communications window of a ground station for which it has traffic for and transmits a beacon 'QTC mail-for' list, the ground station will automatically download its traffic.

As the QTC—Snatch may not be legal in certain countries, this capability is only configurable at the time of loading the program and is not reconfigurable online.

- Automatic Beacon Mode CQ caller.

The PPTP has the capability to call CQ repetitively and either signal you when a reply is received or work the connect and call CQ again after the disconnect.

This ROBOT feature is designed for DX-Peditions, special event stations, meteor scatter, moonbounce, propagation research beacons, areas of low activity and to enable "off-channel" or random frequency HF Packet operation.

In case of abuse: if someone running the PPTP has their beacon timer set too often, the PPTP can be shut down remotely by someone connecting with it and telling it to 'QRT'. This takes them off the air for a while at least.

- Local Area Network (LAN) message store and forward.

The PPTP is capable of storing messages to be delivered in the manner of a 'selective' answering machine. When someone connects, any message pending is delivered without the need for any further action. In case of some error a 'repeat request' function is available.

All stations in the LAN should in the ideal case be able to store messages for any other station in the LAN.

- Bulk dump (forwarding) of messages around the LAN.

There are many instances when the owners wish to take their systems offline yet still wish that their messages be posted in the LAN. The PPTP thus contains a facility for bulk 'dumping' of messages between different computers in the LAN.

Other PPTP features are;

- Capable of recognizing your call in a Packet BBS "Mail" beacon, automatically connecting and downloading your messages.
- Capable of automatically requesting bulletins from the packet BBS on subjects that interest you.
- Automatic optimized configuration of the PK-232, MFJ1278, KAM or TNC for each communications mode.
- Function key 'OVER' feature.
- AMTOR/PACKET MSO and Selective Automatic Answering Machine capability with display of message queue.
- RTTY SELCAL.
- RTTY Navy MARS File Transfer Protocols (PK-232 only).
- Contest operation, sends standard message and automatically increments QSO count.
- Single keystroke set up to receive UOSAT-OSCAR 9 and AMSAT Phase 3 RTTY Telemetry (PK-232 only).
- 10 File buffers for custom messages which can be viewed online.
- SAREX Attack Mode and packet capture capability.
- Time of Day Clock display.

LAN Protocol (G3ZCZ Version)

LAN-LINK

All this and more is available for the IBM PC and clones in the shape of LAN-LINK.

LAN-LINK can now be used on the PK-232, KAM, MFJ1278 as well as the TNC1, KPC-2 and all the TNC2 clones.

The major development, debugging and testing of LAN-LINK (PK232COM (as it was first called) Versions 1.00 to 1.41) took place in Jerusalem in the summer of 1987. There the ROBOT station G3ZCZ/4X using just an FT-101 and a dipole antenna operated on an intermittent schedule mostly overnight and on weekends mainly on 20 Meters AMTOR and Packet until the power supply transformer in the FT-101 smoked.

Amongst its achievements were;

- WAC in both Packet and AMTOR communications modes.
- It worked nearly 50 countries each on both AMTOR and Packet.

The computer said that it made 663 Packet connects with 371 different stations, and 526 AMTOR links with 330 different stations in various countries.

- A 10 day long AMTOR QSO between G3ZCZ/4X and VU2IJ in which VU2IJ would link up, receive his message and leave a reply which would be answered the following day.
- The first intra-Jerusalem (perhaps even intra-4X) AMTOR QSO which took place between G3ZCZ/4X and 4X6AA. The unusual part of the QSO was that both G3ZCZ and 4X6AA were operating 4X6AA, while the Robot was operating at G3ZCZ/4X.
- Pioneer Robot Propagation Beacon Experiment. The Robot put out a CQ every 2 to 4 minutes when active. This

(cont'd on next page)

must have been the world's first HF Beacon station that could receive propagation reports from listeners in real time. This was not a mailbox. Whereas I (the beacon keeper) could leave essages for anyone and did, others could only leave them for me. Several stations contacted, commented that they used the robot as an indicator of propagation, and I could tell by the log when propagation was present to DX areas.

If such Robot beacons were to replace the existing IARU HF beacons, and were to be located in remote DX locations, I feel sure that the QSL hunters would be more than glad to work them and provide propagation reports in real time.

Acknowledgements.

I would like to acknowledge and thank the many radio amateurs around the world for their help, suggestions and patience in the design, testing and debugging of the many features of the program.

Availability

LAN-LINK is being distributed as Shareware in which the user can try it out before registering his copy. Registered copies which entitle the owner to upgrades and full support are available from the author at $35.00. Users of earlier versions of LAN-LINK and of PK232COM Version 1.48 may upgrade by sending in a blank formatted disk and SASE.

Joe Kasser, G3ZCZ
POB 3419, Silver Spring, MD 20901
Tel. (301) 593 6136

(cont'd from page 19)

As you can see, Hamrad is much more than just a logging program. But rather a complete software package for the active ham radio operator. There are few bugs in the programs and most center around the use of the printer. It is almost impossible to write a program so every printer ever made will work.

I also find I'd like to see some more prompts before you leave a module. If you print out the log, you can't stay in that module, but are taken back to the main menu.

When logging in "real time" the program uses the system time and date. Should fudge both so the operator does not have to change DOS time and date.

No question about it. I'm a bit picky. But computers are suppose to ease the burden of data handling. Hamrad does just that. While it will not interface with the new radios, it does what it promises, and does it quite well.

The HAMRAD DSK3 Program reviewed in this article is available for $50.00 plus $2.50 s/h. When ordering, be sure to include disk format, callsign and your exact Latitude & Longitude (Degrees, Minutes and Seconds). Mail order to:
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-Source: WestLink Report-

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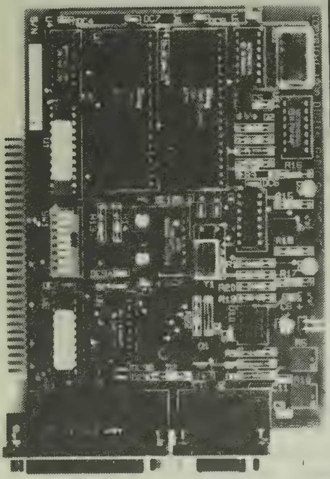

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COMPUTERS

by ***Jonathan L. Mayo, KR3T***

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★ Computer Viruses: Part 1 ★

The world of personal computing is teeming with talk of computer viruses these days. It seems as if everyone has a virus-related story to tell; however, sure facts are difficult to come by. As a user of a personal computer, or PC, you are probably concerned about exactly what a computer virus is and what they do as well as how to protect your system from being infected by one and what to do if you suspect your system has been infected. This article provides an introduction to the subject of computer viruses by differentiating them from other potentially harmful or malicious programs.

Logic Bombs, Trojans, Worms, and Viruses

A computer virus is just a computer program - no more and no less. Computer viruses do not "magically" appear; rather, they are planned out and programmed by someone to accomplish a specific purpose. What makes computer viruses and related programs different from other computer programs, such as spreadsheets and word processors, is that they most often generate havoc and despair rather than increase productivity.

Computer viruses are often confused with similar types of programs known as Trojans and logic bombs. The best way to understand what computer viruses are is to first understand Trojans and logic bombs. These two types of programs encompass much of what most computer viruses do, although you will shortly see that computer viruses are also very different.

A logic bomb is typically a very short program that is added to an existing program or, in some cases, a modification made to an existing program. It is called a logic bomb because it is set to "explode" when certain conditions are met. An apt analogy is pressure triggered bombs that are sometimes hidden by terrorists in luggage stored in the unpressurized baggage compartments of airplanes. When the plane reaches high altitudes and the air pressure in the baggage compartment drops to the necessary level, the pressure bomb is triggered.

The computer equivalent to a pressure bomb is a logic bomb program hidden inside the complex computer code for an applications program, such as an accounting package. The logic bomb must be added to the application program by someone with the access to the computer system and the knowledge to alter the program. For this reason, most logic bombs are left by "insiders" who wish to hurt the organization serviced by the computer, such as a recently fired programmer. Once the programmer suspects that he might be fired, he writes a logic bomb and inserts it into the accounting software program. The logic bomb might have been programmed to destroy all financial records on the computer system's disks on 01 January of the following year. Should the programmer not be fired, he can later remove the logic bomb.

Logic bombs do not affect personal computers to the degree that Trojans and viruses do because logic bombs are written for particular software programs running on particular hardware systems for a certain malignant reason. However, logic bombs have turned up in the PC world before.

One example is a word processing package that was distributed with a particular PC for free evaluation use for a limited time. Users who decided to make use of the word processor were expected to register with the company and pay a fee. Registered users then received a new copy of the program and related documentation. Unbeknownst to users of the word processor, a logic bomb was ticking away in all of the unregistered evaluation copies of the program. When the program was run after a particular date, well after the evaluation period was over, the computer locked up and the word processor proceeded to delete all textfiles stored on the computer's disks.

Trojans are very similar to logic bombs in that when a Trojan is triggered, it can take control of a computer system and destroy data. Trojans get their name from the infamous Trojan Horse of ancient times.

As you may recall from your classical studies, the Trojan Horse was used by the Greeks in their battle against the fortress city of Troy during the Trojan War. The Trojan Horse was a huge, hollow wooden structure in which several Greek soldiers hid. The horse was left outside Troy, and the Greeks feigned retreat. The citizens of Troy, believing that the long war was finally over, accepted the horse as a gift of surrender from the Greeks and brought it into the city. Later that night, as the citizens of Troy slept, the Greek soldiers exited from the horse and opened the city gates where they were met by the returning Greek armada. The Greeks invaded the city, slaughtering and capturing many people, winning the war.

A Trojan, in computer terms, is a program that appears to be something else while in reality containing another program that is usually malicious. For example, a Trojan might be a computer game that also reformats the computer system's hard drive when played. Some Trojans are very sophisticated and have full featured front ends (the program the user believes the Trojan is) while others are very crude and don't do much else except attempt to harm the system they are run on.

Trojans differ from logic bombs in that they are activated whenever they are run on the computer system. One famous Trojan is a graphics program that displays pretty images on the screen while it also corrupts data on the system's hard drive. Logic bombs and Trojans are nasty computer programs that can cause great anguish to PC users, but at least they are limited to the programs that contain them and the systems that these programs are run on -- not so with computer viruses.

Computer virus programs are very similar to both Trojans and logic bombs, but, much like their biological counterpart, computer viruses are capable of spreading to other programs on the computer system and even to other computer systems. Computer viruses can be thought of as independent, infectious logic bombs or Trojans.

Keep in mind that not all viruses, logic bombs, and Trojans are malicious programs. It is conceivable that a beneficial and productive program could be spread and/or triggered using these techniques. However, most all viruses, logic bombs, and Trojans are malicious and most computer users do not want unknown programs operating on their systems.

Another related type of computer program that is always malicious is the worm. A worm is a computer program designed to "slither" through a computer's memory and/or disks, altering any data that it encounters. Depending on the intentions of the worm's programmer, the worm might change all data to zeros or just subtly alter data by swapping individual bytes of stored information. The latter technique is more difficult to discover, and potentially much more dangerous. In many cases, programs will continue to run even though some of the code has been altered and any misspellings in text files might be assumed to be typographical errors. However, imagine the chaos that would occur if corrupted spreadsheet data were used for financial planning or if statistical data were altered.

To recap, computer viruses programs are similar to logic bombs, Trojans, and worms. What makes a computer virus unique is its ability to automatically spread from program to program, file to file, and system to system. From a practical perspective, many people (including some within the computer community) group these similar programs under the generic heading of "computer virus." Using the definitions given in this section, you should be able to group a so-called "virus" into its appropriate category based on what it is and is not capable of doing.

Computer viruses along with the simpler Trojans, logic bombs, and worms, are very dangerous programs. They are certainly not something the average personal computer user would like to have running clandestinely on his system. In order to protect a personal computer from infection by a virus, it is very helpful to understand how viruses work.

A key point to remember about these types of programs is that they must be hidden from the operator of the personal computer they are trying to affect. Not many users would knowingly execute a program that does malicious damage to their computers. Because of this, virus-type programs must be able to conceal themselves, and they do this in a variety of ways.

Hide and Seek

Typically, virus-type programs are hidden within the computer executable code of an applications program. An applications program is any program, with the exception of operating system programs, that is used on the computer. Common examples are word processors, spreadsheets, telecommunications packages, and graphics programs. A virus-type program can infect any of these programs.

Trojan horses are the most common virus-type program that affects applications programs. And the most common types of applications programs that Trojan horses affect are games and graphics programs. Computer viruses also often infect applications programs.

Applications programs infected by computer viruses are one of the primary ways that computer virus are spread. Each time the application program is executed, the virus program is executed. The virus can then replicate and spread, and eventually trigger some event - such as a message display or formatting a hard drive. And if the infected applications program is transferred to another computer, the other computer will also become infected.

Unlike a virus, Trojan horse infected applications programs will not replicate. Also, the Trojan horse program is usually custom written for a particular applications program. Some applications programs are even written around the Trojan horse program; sometimes the applications programs are poorly written, non-functional shells or they can be extensive, working programs. When an applications program containing a Trojan horse is executed, the Trojan horse program takes over and immediately carries out its instructions while the contaminated applications program continues to run.

We've been concentrating our attention thus far on applications programs. Applications programs are the programs that most personal computer operators use on a daily basis. After all, you bought your personal computer so that you could use applications programs. However, there is another classification of programs that all personal computers have - system programs.

System programs are the computer programs that your personal computer needs to operate. These programs are used to format disks, configure memory, keep track of stored files, decode keyboard signals, and a multitude of other tasks. Most often the system programs are packaged together in an integrated package known as the operating system or OS. Operating systems are also referred to as Disk Operating Systems or DOS.

Each type of personal computer has its own type of operating system. Perhaps the best known is MS-DOS, the Microsoft DOS for IBM-PC and compatible machines. IBM also markets MS-DOS under its own label as PC-DOS. Other common operating systems include ProDOS for the Apple //, UNIX, CP/M, and OS/9.

Most personal computer users are not very familiar with the inner workings of the operating system on their computer. Other than when formatting disks and copying files, many users are never even aware they are using the operating system. However, it is important to have a good understanding of your computer's operating system if you are going to successfully protect it from computer viruses.

In order to keep the virus-type programs as short as possible to avoid detection, many virus-type programs make use of the operating system to perform some of their nasty handiwork. There are also many computer viruses that directly infect operating system programs.

Path of Infection

Now that you have a pretty good idea of how virus-type programs can affect your personal computer, we'll take a look at common ways that virus-type programs and/or the programs that contain them are transferred from their originator's computer to other personal computer systems. Computer programs can be transferred in a variety of ways. The most common means of program distribution is via floppy diskettes. Other methods of transferring computer programs include other types of media, such as CD-ROM and tape, as well as telecommunications.

When you purchase a computer program, it comes stored on a floppy diskette. The 5-1/4 inch and 3-1/2 inch size diskettes are the most common. After receiving a computer program on diskette, most users either make working copies of the program on other floppies or copy the program from floppies to their hard drive. A hard drive can contain thousands of programs, data, and other files.

In the case of floppy disk transfers, a virus can get into a personal computer in one of two ways - via a copied program or file from the disk or through the virus' own replication process. Should you run a virus infected program stored on a floppy disk, it is possible for the virus to copy itself to other programs stored on other disks that are attached to the computer.

A Trojan horse program will not replicate; however, if triggered, the Trojan can affect the entire computer system - not just the disk that the program is stored on. And each copy of the Trojan laced program will also contain the Trojan horse program. A worm program contained on a floppy disk based program can work it's way into memory, and it can affect information currently in memory might later be saved on disk.

In some cases, if the operating system files stored on the disk are infected with a virus-type program, it is possible for the Trojan to trigger or the virus to replicate without knowingly having executed any of programs stored on the disk. The reason for this is that many operating system programs are utilized by the computer without the knowledge of the average user.

Sources of floppy disks infected with virus-type programs include just about any place you get software. Be especially wary if you do not know the source of the disk you are putting into your computer's disk drive. It is even possible for commercial, "shrink wrapped," software packages to be infected. Many user's groups have program libraries containing tens of thousands of programs for particular personal computers. Make sure you trust the source of the disks you get through them.

(cont'd on page 24)

(cont'd from page 23)

Now's as good a time as any to bring up the discussion about the main types of software - commercial, shareware, freeware, and public domain. Commercial software is the computer programs you purchase from established companies, such as Microsoft and Borland. An easy way to identify commercial software is by the price of the package, which is usually expensive, the physical quality of the documentation (professionally printed and bound), and the license agreement that came with it. If the license agreement prohibits copying of the program and is very legal-looking, then the accompanying software programs are probably classified as commercial.

You should be very wary of any copies of commercial software that you might run across. Distributing copies of commercial software packages is in most cases very illegal, so the person you are getting it from is already involved in a shady practice known as "pirating" - copying and distributing commercial programs. It is possible that the programs might have been altered to include a Trojan horse or worm program or that the disks are infected with a virus. Think about it; the person that copied these disks probably has hundreds of other illegal copies of commercial software packages that have been used at least once on his computer system. It is not unlikely that he might have picked up, even without his knowledge, a virus from one of them. The bottom line is don't put disks containing copies of commercial software in your disk drives unless you can clearly trace the generations of copies back to the original factory disks.

Shareware is similar to commercial software in many ways. Under the shareware system, users are allowed to copy, distribute, and use shareware programs without paying for them up front. Should the program prove useful, the user is expected to pay the author of the program a fee that is usually specified in the documentation.

Since shareware programs can be legally distributed by persons other than the author, they can have the same problems as illegal commercial software copying in that they can be infected by virus-type programs somewhere in the distribution path. Most copies of shareware programs are perfectly clean; however, always be aware. If you have any doubts about a shareware program that you receive, you can contact the author for a clean copy (many will charge a nominal fee for disk and shipping costs). Most shareware authors are very aware of the virus problem, and take steps to assure that their copies are not infected.

Freeware is very similar to shareware with the exception of any fee for the software. The author of the program allows the program to be distributed and used without receiving any compensation. The same cautions regarding shareware apply to freeware as well.

Public domain software also has no fee attached to it. Public domain software is just that, software in the public domain. The author of the program claims no copyrights to the software; users are free to do what they want with the programs. The authors of public domain software are sometimes difficult to locate. There are many fine public domain programs available for a variety of personal computers; however, there is a lot of junk as well.

Since the programs are in the public domain, users are free to play with the program, often rewriting parts of it. The result is that there can be many different versions of the same program. Since there is usually no way to know if you have a clean copy of the program other than to run it and see what happens, to be safe you should only use public domain programs that are obtained from reliable sources and used by others without trouble.

(cont'd in next issue)

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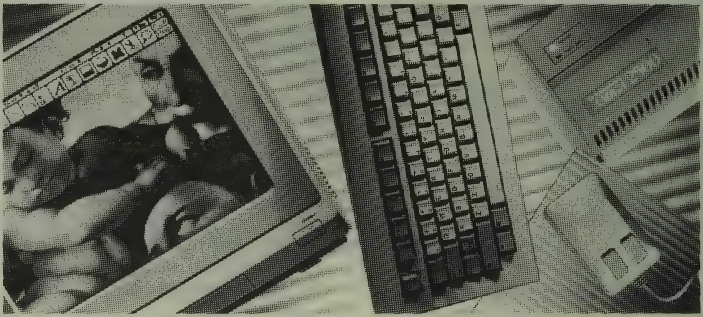

That's our estimate of the number of people who make or enhance their living creating visual images or music. It includes animators, video producers, graphic designers, composers and arrangers, design engineers, illustrators and artists, art directors and chief executive officers (for their multi-media presentations). Which means, to all those creative people, there is now a computer that can not only process words and numbers, but also create almost anything they can conceive. If you're one of these people, come see us.

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Between The Ham Bands...

Short wave excitement only begins on the ham bands!? Ever tune your receiver outside those amateur boundaries and wonder what really goes on there? Every issue we'll try to whet your appetite.

Here's something fun and easy to try this month: All over the globe (and all over the short wave dial) you'll find slow CW markers that repeat their CQ's and ID's over and over. They seem to always be there. And, that makes finding them a snap!

Listen for "CQ's" or "VVV" in cw followed by an ID. This is repeated over and over. The repeated ID may also contain other information such as frequencies that the station is listening on or a clue as to what their service is.

Try this spin down 6 MHZ:

6.379.0 Isreali Navy, Callsign to listen for: "4XZ"
6.462.0 French Navy TAHITI, listen for callsign: "FUM"
6.502.0 Athens Radio, Greece, listen for callsign: "SVU"
6.981.3 Santiago Radio, Chile, listen for callsign: "CCS"

Try looking down 8 MHZ for these:

8.437.0 El Djaza'ir Radio, Algeria, listen for: "7TA6/7TF"
8.471.0 US Coast Guard Puerto Rico, listen for: "NMR"
8.551.6 NATO in Lisbon, Portugal, listen for: "CTP"
8.566.0 South African Navy, Capetown, listen for: "ZSJ4"
8.578.0 Alexandria Radio, Egypt, listen for: "SUH3"
8.657.0 Noumea Naval, New Caledonia, listen for: "FUJ"
8.694.0 Luanda Radio, Angola, listen for: "D3E51/52"
8.992.3 French Navy, Dakar, Senegal, listen for: "6WW"

A tape of the last ID listed here, "6WW" in Senegal is featured on the rock album "EVE" from the Alan Parsons Project! Listen carefully to the very beginning of the song "Lucifer" for the tell-tale "VVV VVV DE 6WW 6WW."

Wow! Have you heard the recent wave of amateur balloons launched in the past few weeks? Some have attained an altitude of over 140,000 feet!!!!!! They take with them amateur beacons for 2 meters and/or 10 meters....and some, even ATV! Everyone checks in on 40 meters during the flight to call in what they hear (and see!). This can be very exciting! One recent launch from OHIO carried an ATV camera that read out the balloon's altitude. The radio gear is carried safely back to earth via parachute. Watch the packet boards for future launch announcements.

My bags were searched this past week each time I tried to fly on business. The problem? Seems as if my SONY 2010 receiver and my Kenwood 2-meter HT look funny in the baggage X-rays! Anyone else having these problems?

A check of the "Computer Shopper" magazine shows the announcement of "RF Computer Equipment" using 902-928 MHZ. Hmmm

GETTING ON PACKET FROM WORK is a blast! How? From my desk PC (and modem) at work I simply call my home PC, using a program called "PC ANYWHERE III". Once connected to my home PC via the home modem on COM PORT 1, I run KANTERM to access my KAM on COM PORT 2. And WELLA! I'm on packet from work. I literally can get on packet back at home from wherever I am in the country!

GOOD GOING ARRL! The "Communicator" license may be just what we need to keep the service going over the long run. Time will tell.

Any questions we can help you with on anything here? Please send queries and submissions. We're glad to help!

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KENWOOD: TS-940, 440, 140, R-5000, 680, 711, 811
YAESU: FT-767, 757 GXII, 757 GX, 747, 9600, 736
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COLLINS: 651 S1

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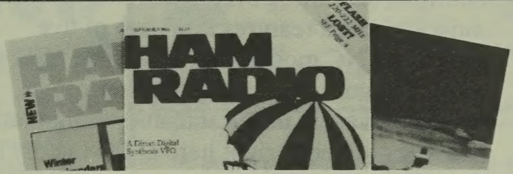

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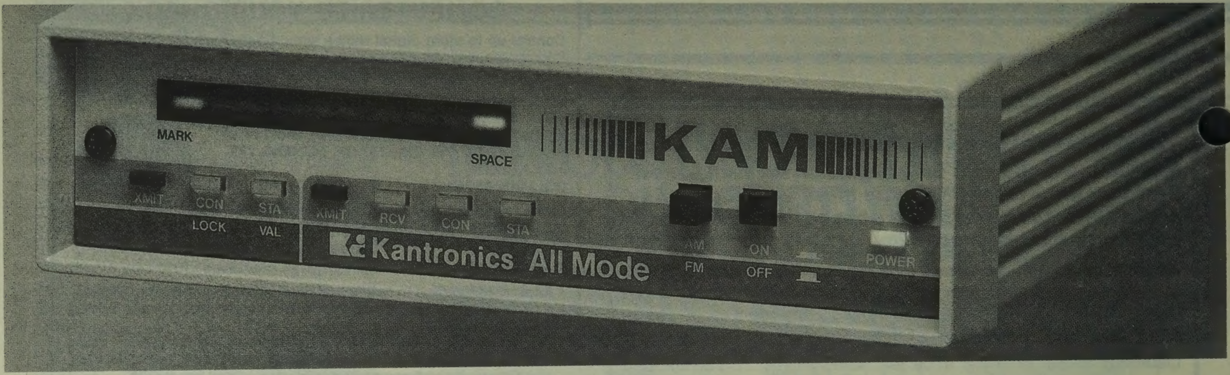

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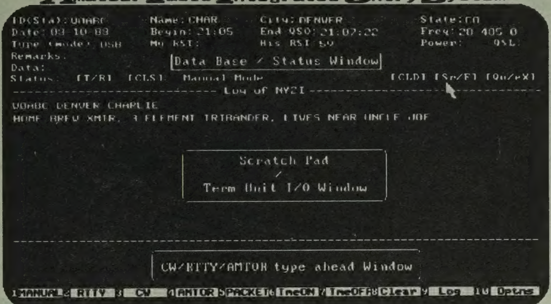

```
ID(Sta):W0ABC        Name:CHAR        City:DENVER              State:CO
Date: 03-10-88       Begin: 21:05     End QSO: 21:07:22        Freq: 20 405 0
Type (mode) USB      My RST:          His RST 59               Power:      QSL:
Remarks:
Data:                     |Data Base / Status Window|
Status:  [T/R]  [CLS]  Manual Mode                       [CLD] [Sn/F] [Qu/eX]
----------------------------- Log of NY2I ------------------------------------
W0ABC DENVER CHARLIE
HOME BREW XMTR, 3 ELEMENT TRIBANDER, LIVES NEAR UNCLE JOE

                         Scratch Pad
                              /
                     Term Unit I/O Window

------------------------------------------------------------------------------
                  CW/RTTY/AMTOR type ahead Window
1MANUAL 2 RTTY 3 CW 4AMTOR 5PACKET 6TmeON 7TmeOFF 8Clear 9 Log 10 Optns
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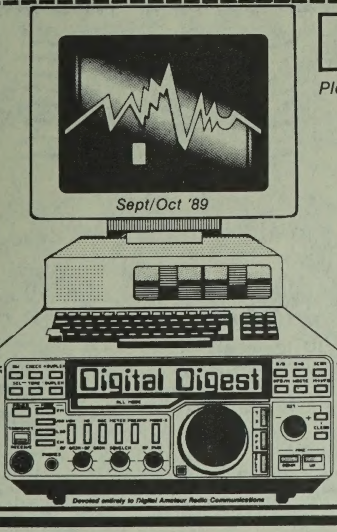

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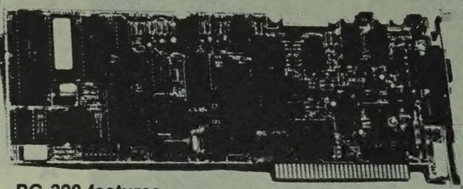

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